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RADIO!

Number Three

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In This Issue:

546 Scanner Frequencies You Can Tune NOW!

211 Frequencies To Listen For On Your World Band Receiver

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Radio Shack's new PRO-2035 scanning receiver brings you action radio at its best. Thanks to extrawide frequency coverage and NFM/WFM/AM modes, PRO-2035 catches communications other scanners miss—police and emergency teams *plus* military aircraft, satellites, 33 and 23cm amateur radio, wireless mikes, studio-transmitter links, Citizens Band, TV audio, FM broadcasts and more.

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Feature-packed and easy to use, PRO-2035 is in a league by itself. Hear it today at Radio Shack.

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RADIO!

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If your letters are any indication, it looks like Radio! *magazine is a big hit. I have heard from hundreds of* Radio! *readers and most letters have been very complimentary.*

Many of you have made suggestions for future articles and I have passed them along to our technical editor.

A few of you have complained about something you didn't agree with and I have answered each and every one of you.

I had a few comments about the bargain price not being a bargain and comments about the only advertising being for Radio Shack.

I believe the bargain price really is a bargain. Just look at the cover price of any magazine on your newsstand and I think you'll agree. And, keep in mind, those expensive magazines on the newsstand contain advertising that was paid for by their advertisers, too.

Our bargain just keeps on getting better. You are Radio Shack customers and we're using some of the space to show you some great Radio Shack products. I don't think an apology is necessary.

Meanwhile...technology continues to shrink the world. As I type this editorial on a laptop computer, I am flying to Tokyo. But, even though satellite communications enable airplanes to communicate with their home bases and let me phone the office, they still carry SSB radios—just like many of you have at home. Technology is what makes this hobby so wonderful. You can do so much with a simple portable shortwave radio, from listening to a shortwave broadcast to receiving weather faxes.

And, speaking of Tokyo, Japan has only half the population of the U.S. but has almost 1.3 million hams, compared with less than 650,000 here in the U.S. I hope that we can continue to attract youngsters to our hobby, and that they may become tomorrow's electronics business leaders.

I know that you'll enjoy the third issue of Radio! *Remember, this is your magazine, tell me what kind of articles you would like to see. Until the next issue, 73.*

Robert B. Miller AA5FL

Vice-President, Radio Shack

EDITORIAL STAFF

Robert B. Miller, AA5FL
Publisher

Harold Ort, N2RLL
Editor

Edith Lennon, N2ZRW
Managing Editor

Linda Romanello
Assistant Editor

Deena Marie Amato
Editorial Assistant

CONTRIBUTING EDITORS

Steven T. Adams
Gerry L. Dexter
Donald E. Dickerson, N9CUE
Chuck Gysi, N2DUP
Allen Lorentson, N3DCX
Dave Marshall, N8OAY
Lorraine S. Matthew, N4ZCF, AAA9PR
Harold Ort, N2RLL
Bill Price, N3AVY
Don Schimmel
Myke Weiskopf
Gordon West, WB6NOA

PRODUCTION STAFF

Elizabeth Ryan
Art Director

Edmond Pesonen
Electronic Composition Manager

Dorothy Kehrwieder
Production Manager

Emily Kreutz
Assistant Production Manager

Larry Mulvehill, WB2ZPI
Photographer

Hal Keith
Technical Illustrator

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They've got questions.

We've got answers.

How does a radio work? Taking one apart isn't the best answer. It's really more fun to put one together.

Kids have a natural curiosity—about everything. At Radio Shack we know that building something—like a radio—can be a lot more fun than just reading about it. That's why we offer Science Fair Kits that let kids create and experiment with the things they have questions about, and some things they haven't thought of yet. Some have literally hundreds of projects, and all use battery power, not electricity, so they're fun, educational and **safe**!

Kids have questions. Radio Shack can help them find answers.

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"It's A Perfect Day For A Picnic. What Could Possibly Go Wrong?"

Just thirty minutes from now, the Burtons' favorite picnic spot will become perfectly awful when a fast-moving storm suddenly appears. But the Burtons came prepared. Their pocket Weatheradio® Alert will sound a full-volume alarm when the weather station sends a warning signal. For details, they'll simply flip a switch and listen.

Radio Shack offers America's largest selection of weather-band receivers, with models for home, on-the-go, even CB/weather-band combos for vehicles. Join the millions of satisfied owners! At prices starting at only $19.99, how could you possibly go wrong?

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You've got questions. We've got answers.℠

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The Fall foliage is beautiful around Groton, Vermont. Be sure to keep your ears on your scanner while leaf-peeping. (Photo courtesy of Dr. John C. Weaver.)

Brilliant Color and Crackling Excitement—Scanning Northern New England

Amid the rolling hills, serene lakes, and spectacular coastline, there's plenty of scanning action in the Northeast.

By Chuck Gysi, N2DUP

There's no time like autumn to explore the north of New England and all that its quaint towns and villages have to offer the visitor. As the season turns cool, the foliage turns spectacular, offering breathtaking colors at almost every vista.

While northern New England is a beautiful place to visit, Vermont, New Hampshire, and Maine are *also* great states for scanning. There's plenty of action to be heard both in the mountains and along the coast. Inland lakes also provide interesting material for the scanner monitor.

Here's a list of frequencies used in northern New England. So take along your scanner while leaf peeping, and you'll enjoy your Fall motoring trip that much more.

MAINE

Maine State Police

154.710, F-1, statewide tactical
154.695, F-2, statewide car to car
154.665, F-3, Zone 1 - Troops A, E, F (south) and G (Maine Turnpike)

Compass Pond at Mount Katahdin, Millinocket, Maine, is a pretty sight. Even in sparsely populated areas of the northeast, you'll find scanning action from county sheriffs, state police, forest fire crews, and businesses. (Photo courtesy of Maine Office of Tourism.)

Skiing is a popular activity in Maine, New Hampshire, and Vermont. Here a skier takes to the slopes at Sunday River Ski Resort in Maine. Most ski communications take place in the 151 and 154 MHz business bands, while ski patrols make use of the 155 MHz special emergency channels. (Photo courtesy of Maine Office of Tourism.)

154.650, F-4, Zone 2 - Troops C, D, G (Maine Turnpike), headquarters, academy
154.905, F-5, Zone 3 - E, F (north) and J
154.935, F-6, car to car, radar patrols
155.475, F-7, nationwide police emergency, tactical
156.045, F-8, backup channel for Maine Turnpike
154.920, detectives
460.225, mobile extenders

Maine Turnpike

156.045, state police backup channel
151.070, maintenance - north
151.130, maintenance - south

Statewide emergency

154.310, statewide fire mutual aid
453.700, state fire marshals
45.64, F-1, emergency management
45.56, F-2, emergency management
155.865, state services

Department of Transportation

47.14, statewide car to car
47.22, Divisions 1, 4
47.26, Divisions 2, 6 (secondary), lab
47.12, Division 6
47.32, Division 5
47.34, statewide dispatch, Divisions 3, 7
47.04, flagmen at work sites, speed limit sign controls
453.400, paging in Augusta
156.015, state airport maintenance at Augusta
156.650, drawbridges VHF marine

Department of Conservation

159.360, F-1, eastern region
159.390, F-1, northern region
159.420, F-1, western region
159.450, F-1, southern region
159.330, F-2, statewide
154.815, F-6, car to car
154.725, fish and game wardens, north
155.970, fish and game wardens, south
155.655, fish and game wardens
155.730, fish and game wardens statewide car to car
151.265, Wells National Estuarine Reserve
151.595, marine patrols along coastline
151.400, forest fire crews
159.255, forest fire aircraft
159.285, forest fire fireground
159.240, parks
159.300, Baxter State Park F-1 (also 151.355 F-2, 159.225 F-3)

National Parks

170.575, White Mountain National Forest

164.175, Acadia National Park

Auburn-Lewiston

159.150, Auburn police

851.0875, 851.8375, 852.5875, 853.3375, Auburn police

153.890, Auburn fire F-1 dispatch

154.310, Auburn fire F-2 mutual aid

154.205, Auburn fire F-3 backup

158.790, Lewiston police F-1 dispatch

154.695, Lewiston police F-2 statewide mutual aid

153.950, Lewiston fire F-1

154.250, Lewiston fire F-2

Bangor

155.610, police F-1 dispatch

155.475, police F-2 nationwide mutual aid

154.220, fire dispatch

154.310, fire statewide mutual aid

Portland-South Portland

155.490, Portland police F-1 dispatch

155.535, Portland police F-2 regional net

158.970, Portland police F-3 intercity net

155.085, Portland police F-4

154.280, Portland fire F-1 dispatch

153.830, Portland fire fireground

155.610, South Portland police dispatch

155.850, South Portland police car to car

155.535, South Portland police regional net

155.550, South Portland police regional net

154.430, South Portland fire F-1 dispatch

154.070, South Portland fire regional net

154.310, South Portland fire statewide mutual

Maine Miscellaneous

463.950, Appalachian Mountain Club

461.500, L.L. Bean, Freeport (also 462.100, 463.6125, 464.675, 464.7625)

154.600, Portland Museum of Art

Note: Most ski areas operate on some of the following frequencies, 154.515, 154.540,154.570, and 154.600.

NEW HAMPSHIRE

New Hampshire State Police

44.94, F-1, Concord headquarters, turnpike

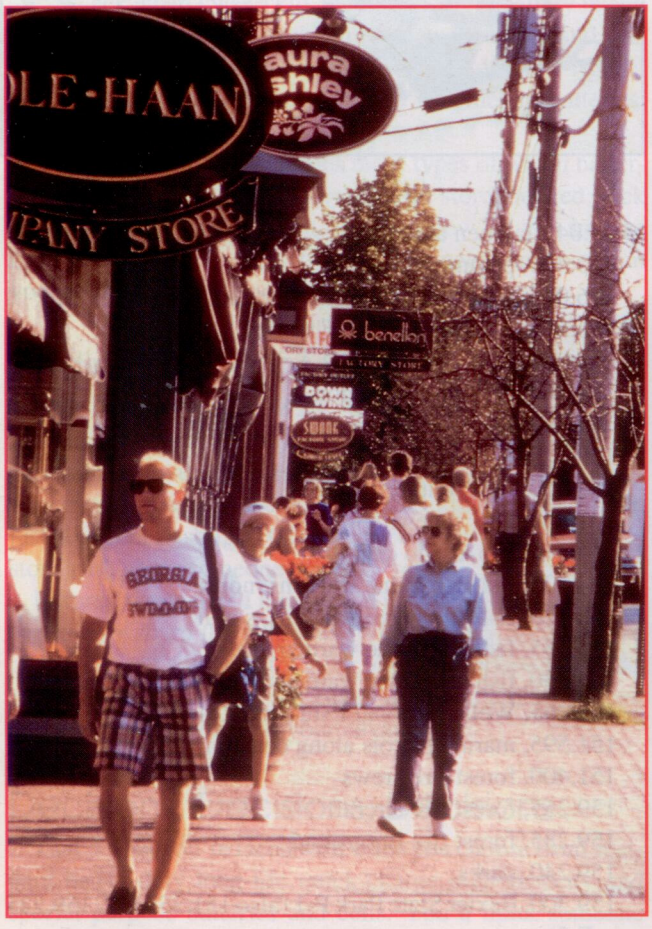
44.82, F-2, statewide car to car

45.26, F-3, Troop F (Twin Mountain)

45.30, F-4, Troop A (Epping)

45.22, F-5, Troop C (Keene)

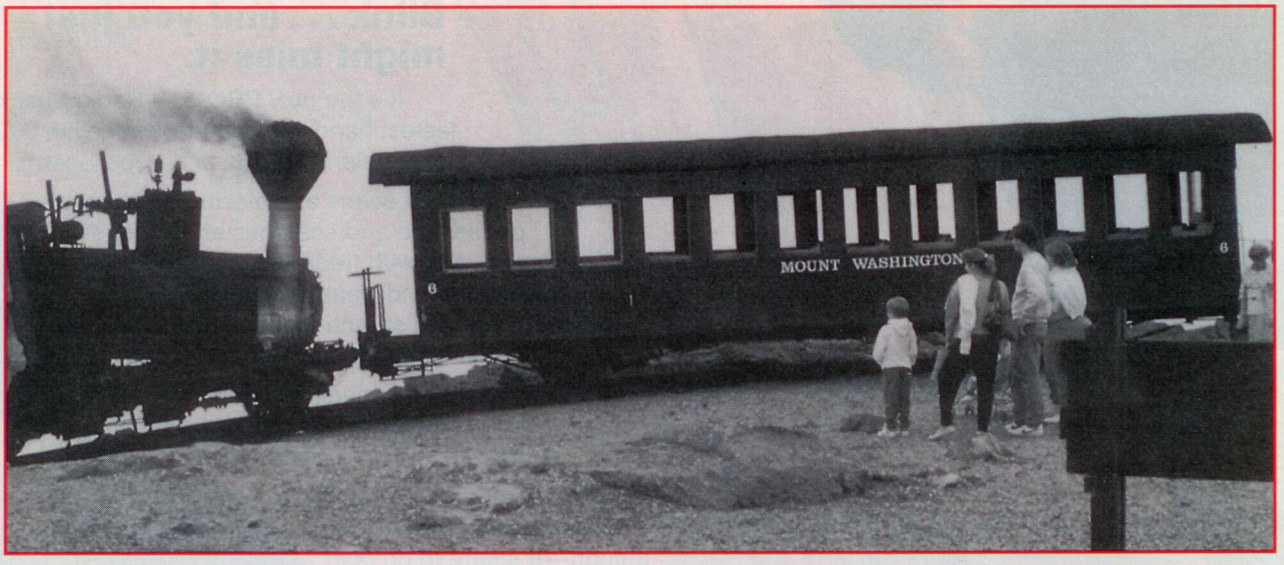
45.46, F-6, Troop E (Moultonboro)



Shopping in Freeport, Maine, attracts lots of visitors, especially the L.L. Bean factory store. Be sure to bring along your scanner because L.L. Bean uses several frequencies in Freeport. (Photo courtesy of Maine Office of Tourism.)

Atop the northeastern United States' highest peak, at 6,288 feet, sits this famous weather observatory at Mount Washington in New Hampshire. Because of its vantage point, several two-way radio antennas are situated at the top of the building. (Photo by Chuck Gysi, N2DUP.)

Blink . . . and you just might miss it.
It's the new PRO-51—Radio Shack's fastest handheld scanner ever, with 200 channels, 800 MHz and HyperScan™.
PRO-51 scans at a blazing 50 channels per second and searches at 100 per second. And with frequency ranges for air, fire, marine and weather services *preprogrammed*, you can search those bands even if you don't know frequencies for your area!
PRO-51 has priority, lockout and scan-delay. Backlit LCD display. Even a 3-day memory backup if power's lost.
You can see PRO-51 at Radio Shack today. Better hurry, though—it's sure to go *fast!*
VRROOOM!
SCAN
MANUAL
BAND
PRI
PROG
L/OUT
MONI
K/L
CLEAR
LIGHT
AIR
FIRE
MARINE
WX
DELAY
LIMIT
ENTER
Radio Shack
200 CHANNEL DIRECT ENTRY PROGRAMMABLE SCANNER
The other guys have a lot of catching up to do.
Radio Shack®
You've got questions. We've got answers.℠



If you don't want to drive or take a van to the top of Mount Washington in New Hampshire, you can ride the Mount Washington Cog Railway to the summit. As the train chugs along, listen to its operations on 160.410 MHz. (Photo by Chuck Gysi, N2DUP.)

45.18, F-7, aircraft and radar patrols
45.02, F-8, Troop B (Bedford)
44.98, F-9, Troop D (Bow)
44.86, F-10, statewide car-to-car secondary
44.78, crime task force
155.475, nationwide police mutual aid
154.920, mobile extenders
856.2125, marine patrols in Lakes Region

Note: The state police is moving toward a statewide digital system. The above frequencies still are active, however.

Statewide emergency
155.625, Registry of Motor Vehicles
46.58, emergency management statewide
46.56, emergency management car-to-car

Department of Public Works and Highways
37.94, turnpikes
453.975, statewide
453.925, Division 1 (Lancaster)
453.775, Divisions 2, 3 (Lebanon, Laconia)
453.625, Division 4 (Keene)
453.675, Division 5 (Hooksett)
453.325, Division 6 (Durham)

Environmental
151.340, Fish and Game Department primary
159.465, Fish and Game Department car-to-car
151.325, Fish and Game Department secondary
151.445, Forest Service F-1, south
151.295, Forest Service F-2, north
151.340, Forest Service car-to-car with Fish and Game
159.225, Forest Service car-to-car, aircraft
151.385, Parks F-1
159.375, Parks F-2

National Parks
173.7625, Saint-Gaudens National Historic Site
171.525, White Mountains National Forest

One of the most photographed scenes in Vermont is in Waits River. In addition to your camera, required equipment is your scanner to monitor the Vermont State Police on the 460 MHz band. (Photo courtesy of Vermont Department of Travel and Tourism.)

REACT
462.675, Concord and Nashua REACT
Concord
155.625, Police dispatch
155.820, police car-to-car
154.355, Capitol Area Fire Mutual Aid F-1 dispatch
154.235, Capitol Area Fire Mutual Aid F-2 fireground
154.280, Capitol Area Fire Mutual Aid F-3 fireground
154.220, Capitol Area Fire Mutual Aid F-4 fireground
Manchester-Nashua
156.210, Manchester Police Tac-1 dispatch
155.475, Manchester police Tac-2 national mutual aid
154.845, Manchester police Tac-3 detectives, backup
158.730, Manchester police Tac-4 car-to-car
460.625, Manchester fire dispatch
460.600, Manchester fire backup dispatch
460.5125, Manchester fire fireground (also 460.5375)
154.965, Manchester EMS dispatch
460.100, Nashua police F-1 tactical
460.200, Nashua police F-2 dispatch
460.325, Nashua police F-3 detectives
465.100, Nashua police F-4 car-to-car
154.325, Nashua fire operations
151.250, Nashua fire dispatch
154.190, Nashua fire mutual aid
154.280, Nashua fire mutual aid
458.500, Nashua fire mobile extenders
Portsmouth
153.905, Police F-1
154.740, Police F-2 dispatch
154.190, Fire F-1 Seacoast tie
154.280, Fire F-2 fireground
153.905, Fire F-3 link with police
154.340, Fire F-4 dispatch
Miscellaneous New Hampshire
463.950, Appalachian Mountain Club
161.250, Conway Scenic Railroad
463.950, Mount Washington Observatory
151.745, Mount Washington Stage Co. vans
160.410, Mount Washington Cog Railway
151.895, Mount Washington Summit Road Co. service trucks
469.975, Storyland (Glen)

Note: Most ski areas operate on some of the following frequencies, 154.515, 154.540, 154.570, and 154.600 MHz. In addition, ski patrols usually use 155 MHz special emergency radio service frequencies, including 155.205, 155.220, 155.235, 155.265, 155.295, and 155.340 MHz.

VERMONT

Vermont State Police
460.225, F-1 Troop A (St. Albans, Colchester)
460.150, F-1 Troop B (Derby, Middlesex, St. Johnsbury)
460.375, F-1 Troop C (Middlebury, Rutland, Shaftesbury)
460.475, F-1 Troop D (Brattleboro, Bethel, Rockingham)
460.425, F-1 Troop E (Middlesex)
460.500, F-2, statewide car-to-car
460.025, F-3, statewide mutual aid
460.275, F-4, statewide interdepartmental
458.950, investigators
Statewide Emergency
460.450, county sheriffs common
45.52, emergency management
Transportation Agency
159.180, highway crews, north
159.195, highway crews, south
159.075, car-to-car
Environmental
159.405, Fish and Game F-1
151.475, Department of Forests, Parks and Recreation
National parks
169.175, Green Mountain National Forest
Barre
460.075, police F-1 dispatch
460.500, police F-2 statewide car-to-car
460.025, police f-3 statewide mutual aid
460.150, police F-4 state police
460.425, police to state police
154.190, fire, capitol area net
155.235, regional ambulance
Burlington
460.125, police F-1 dispatch
460.500, police F-2 statewide car-to-car
460.025, police F-3 statewide mutual aid
460.275, police F-4 statewide interdepartmental
460.625, fire F-1 dispatch
460.600, fire F-3 fireground
Rutland
460.200, city police F-1 dispatch
460.150, town police F-1 dispatch
460.500, police F-2 statewide car-to-car
460.025, police F-3, statewide mutual aid
460.575, fire dispatch
460.600, fire fireground
154.250, county fire
154.540, regional ambulance
Vermont Miscellaneous
151.895, Shelburne Museum
157.560, Brattleboro Retreat (also 154.600)

Note: Many ski areas in Vermont use frequencies in the 151 MHz business band (151.625 to 151.955 MHz). In addition, ski patrols usually use 155 MHz special emergency radio service frequencies, including 155.205, 155.220, 155.235, 155.265, 155.295, and 155.340 MHz. ■

In Profile: The Walnut Creek, California, Police Department

These highly-trained officers and dispatchers are all eager to show off their state-of-the-art system.

By Steven T. Adams

Situated on the eastern edge of the San Francisco Bay area, the city of Walnut Creek, California, covers about 22 square miles of Contra Costa County and has a population of about 65,000. Recently, I had the opportunity to visit the local police department of Walnut Creek. I was able to look inside their communications center, talk to their captain, take pictures, and ask plenty of questions. Here's just some of what I found.

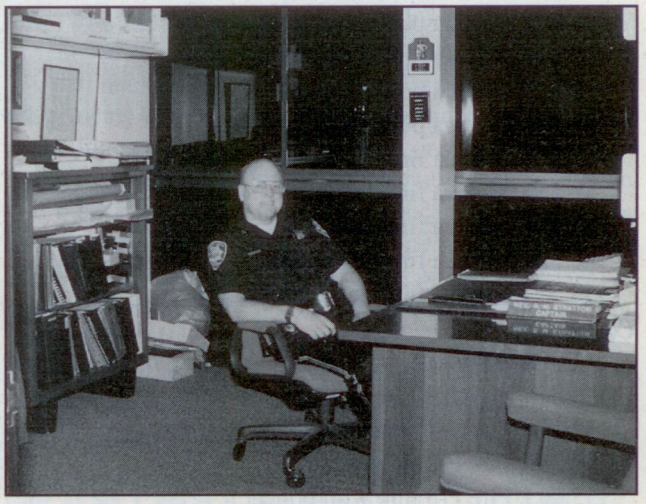
The Department at a Glance

Currently headed by Chief of Police Karel A. Swanson, the Walnut Creek police department is well-served by its 78 sworn officers and 12 dispatchers, along with a dedicated supporting administrative staff.

Prior to 1980, the department dispatched from one tabletop console and used the crowded 155-MHz frequency band. In 1980, the department moved into a new headquarters building, complete with a dedicated dispatch center. They switched to the 460-MHz band, which is still used today. By the end of this year, four state-of-the-art communications consoles will be upgraded to serve the department well into the next century.

Captain Neil R. M. Stratton, a 31-year veteran, commands the Administration Division, which includes their communications center. Captain Stratton has been instrumental in keeping his department in the forefront of law enforcement communications, record searches, and mobile data systems with a new information network.

This network allows different agencies with different computer systems to link together to exchange and transfer valuable law enforcement information. Prior to this system, investigators often lacked important data relevant to their cases. Now, authorized system operators can request and transfer data in a timely and efficient manner.



Captain Neil R. M. Stratton of the Walnut Creek Police Department commands a state-of-the-art communications system.

Eventually, the information network will allow officers on patrol to access the All County Criminal Justice Information Network, a central name index, remote booking system, Justice Automated Want System, and the National Crime Information Center (NCIC). Stratton is currently promoting his data transfer network at the state and federal levels as well as in the advanced criminology courses for command officers that he teaches at several colleges and universities.

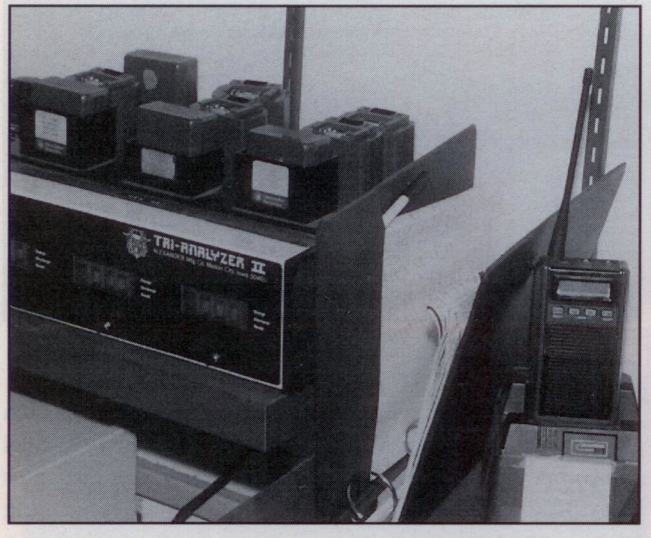
A thoroughly Modern System

The department uses the Computer-Aided Dispatch System (CADS) to manage its communications traffic. Dispatchers handle 911 emergency calls using a standard computer keyboard with a Windows-type format. This replaces the older checklists and cards used for emergency situations.

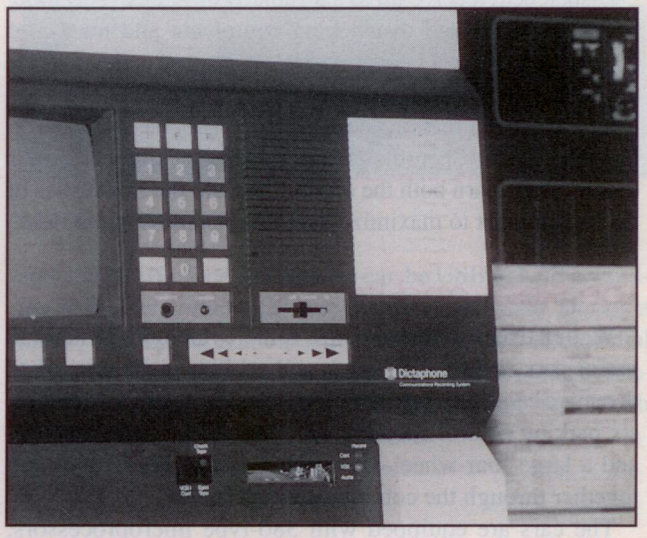
The CADS works like this: Incoming 911 calls are automatically entered into the system via the call monitor subsystem or a standard computer keyboard, then onto an electronic template in the computer program. The call monitor

Walnut Creek Police Department Motor Officer Kris Harman gets ready to go on patrol on the day shift.

Unit monitoring equipment assists dispatchers by giving status and location of all units in the field.



Handie-talkies charging in the Communications Center.



Recording equipment for the police radio system and 911 calls.

sub-system shows the pertinent data for each incoming 911 call. This includes the phone number and address of the originating call, so dispatchers can make return calls in the event of interruptions or incomplete calls. Calls for medical emergencies and fires are sent to the Consolidated Fire District where dispatchers send the appropriate units in response.

An electronic report of the incident is generated and transmitted, either verbally via the department's radio system or by data link, to the Mobile Data System (MDS) in each patrol car. Officers stay in touch with dispatchers through handie-talkie radios while out of their vehicles. Data is permanently stored in the system's hard drive and hard copy can be printed out immediately in the communications center.

A unit monitor assists dispatchers in keeping track of the status and location of all units on patrol and out in the field. The display blinks to call attention to changes of status and always lets the dispatcher know where the closest units are located for dispatching and backing up other officers.

Common Commo

Radio controls are accomplished by touch screen. During police emergencies, dispatchers can restrict radio traffic on a channel by activating "Code-33," or emergency traffic only. An electronic beep is sent over the channel, telling officers that the channel is reserved for a particular incident. Routine police business and radio traffic is then switched to a secondary channel. This situation occurs during pursuits, crimes in progress, officers requesting cover and backup, or in other police emergencies. For the scanner enthusiast, this electronic tone lets you know this channel is worthy of close monitoring! But scramblers as well as cellular phones are

used on occasion to relay sensitive data to and from the field.

The communications center also monitors neighboring communities for suspect and crime information or in the event assistance is needed in those areas. This is done using the California Law Enforcement Radio System (CLERS). Mutual aid agreements, along with a dedicated police frequency, ensure that command and control is carried out swiftly and professionally in all emergency situations. Officers on patrol and dispatchers can communicate with the California Highway Patrol, Contra Costa County Sheriff's Department, East Bay Regional Parks, Bay Area Rapid Transit (BART), and other neighboring communities and agencies via cellular phones and the CLERS.

To make sure all of the city's varied terrain is adequately covered by radio, repeaters have been used since 1976. They're strategically placed on high buildings and surrounding hills and are controlled by a computer. The computer automatically selects which repeater to use, based on signal strength and unit location.

Dispatcher Training

Dispatchers receive up to six months of intensive training on the sophisticated dispatching equipment and must also learn all the 10 and 11 codes, vehicle and penal codes, and the jargon of police work. Police officers receive communications theory as part of their academy curricula and spend an additional four hours of on-the-job training in the communications center. They learn both the capabilities and the limitations of their equipment to maximize their effectiveness in the field.

The Fleet and Its Operation

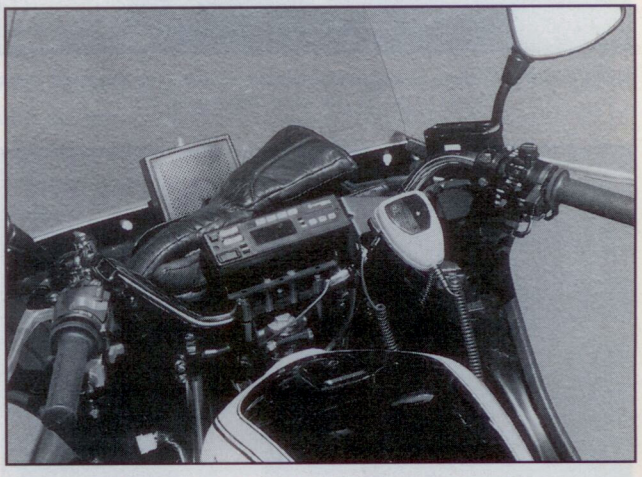
Walnut Creek's fleet of police vehicles includes 18 marked patrol cars (traditional black and white), eight unmarked detective cars, nine police motorcycles, two police dirt bikes, six parking control scooters, an emergency operations van, and a large four-wheel-drive police truck. They're all tied together through the communications center.

The cars are equipped with 386-type microprocessors, similar to those in personal computers. These go beyond typical Mobile Data Terminals (MDTs) in that they are, or soon will be, capable of interfacing with all current and future law enforcement information networks. The Walnut Creek Police Mobile Data System (MDS) uses 800 MHz to operate the data link. This assures compatibility with all systems well into the future.

The department also has an emergency operations van, called ORCA (Operations, Resource, Communications Auxiliary), which is frequently used by public safety agencies throughout the county. It's fully equipped to serve as a command and control center for natural disasters, hostage situations, major crime scene coordination—even the annual Walnut Festival held each September. (This van, incidentally, will be profiled in a future *Radio!* article.)

A sister vehicle to ORCA, called FLIPPER, is a big Chevrolet Suburban four-wheel-drive truck completely equipped with lights, siren, and all the other standard police equipment. It's used during inclement weather operations, search and rescue missions, and for patrolling the city's off-road areas. The department also uses Kawasaki police dirt bikes for patrolling off-road areas and for crowd control during parades and festivals.

The 386 microprocessor controls the mobile data system in the Walnut Creek Police Department patrol cars.



Radio equipment on the police motorcycle.

Helicopters are available from the East Bay Regional Parks Department (call sign Eagle One) as well as from the California Highway Patrol. They're used for monitoring or taking over police pursuits, general surveillance, or other police and rescue functions as needed.

Using the mobile data systems in their vehicles, officers in the field can access the NCIC in Washington, D.C. Soon they'll also be tied into a county-wide network, giving them instant access to central names files, wants and warrants information, motor vehicle information, and state and federal networks. Ultimately, they'll be able to take photos or fingerprints in the field and send or receive facsimile copies from the 386 microprocessor installed in their patrol cars!

Scanners Everywhere!

Scanners are evident throughout the department. The Watch Commander, a lieutenant, uses a 400-channel scan-

Two Walnut Creek Police Department dispatchers handle communications on a Friday night.

ner in the Watch Commander's duty office, while the Division Commander and Communications Center always have a small base station scanner operating to keep abreast of local events. Many patrol officers also use scanners, both on and off duty, to stay current on events and to monitor activities of neighboring communities which may affect them.

An Invitation to *Proper* Involvement

The Walnut Creek police department encourages citizen involvement in reporting crimes. They receive many citizen's tips, mainly through cellular phone calls reporting traffic collisions, drunk or reckless drivers, and other such helpful observations. But, like hardworking police officers everywhere, they discourage the illegal activity of "ambulance chasing," or using a scanner to go to crime or disaster scenes. Although the department has no official policy regarding private ownership and use of scanners, officers realize that many citizens enjoy monitoring public safety radio transmissions. While they also know that this information can be used illegally by criminals, they acknowledge that this is one of the prices we pay to live in a free society. Naturally, all hobbyists should be responsible in the pursuit of their interests.

The people of Walnut Creek are well-served by their police department. Pride and professionalism was evident in everyone I spoke with. They were all eager to show off their department, especially their busy communications center. So, if you're ever in this part of California, you, too, can be part of the action by listening to their communications on the frequencies listed here. ■

Walnut Creek Police Department Frequencies (MHz)

460.425 Primary Dispatch
460.325 Secondary Dispatch/Inquiry
460.025 CLEMARS (California Law Enforcement Mutual Aid Radio System)
460.100 County Common (Contra Costa County Mutual Aid)

Ten Codes

10-01	Poor copy
10-02	Copy ok
10-03	Changed channel
10-04	Message received
10-05	Relay radio message
10-06	Stand by
10-07	out of service
10-07A	Out of service at home (also 10-7R)
10-07B	Out of service, bathroom (also 10-7P)
10-07od	Out of service, off duty
10-08	In service, available
10-09	Repeat
10-10	Out of service, end of shift, off duty
10-12	Visitors present, use caution on message
10-13	Advise weather and road conditions at scene
10-14	Convoy or escort detail
10-14F	Funeral detail
10-15	Prisoner
10-15X	Female prisoner
10-16	Pick up...
10-18	Finish present assignment quickly
10-19	Enroute to or return to the station
10-20	Location
10-21	Telephone
10-22	Cancel
10-23	Stand by
10-24	Trouble at...
10-25	Respond as a backup
10-26	No warrants or wants, clear
10-27	Subject wanted
10-27A	Subject wanted, possibly armed
10-27F	Subject wanted, felony charge
10-27M	Subject wanted, misdemeanor charge
10-27P	Wanted, parking charge
10-27T	Wanted, traffic charge
10-27V	Wanted, stolen vehicle
10-28	Request for wants, warrants, and registration
10-29	Check to see if subject is wanted
10-30	(CHP only) Possible Golden Gate jumper
10-30M	Outstanding warrants
10-31	Has record, but not wanted
10-31A	No records, no wants
10-31F	Felony record, but not wanted
10-31M	In file, not wanted
10-32	Drowning
10-33	Burglar alarm
10-33S	Burglary alarm, silent
10-34	Open door
10-35	Priority assistance needed (Code 2+)
10-36	Outstanding warrant, subject or vehicle wanted
10-36A	Outstanding warrant, subject wanted, possibly armed
10-36F	Felony warrant

10-36M	Misdemeanor warrant
10-36V	Warrant on vehicle
10-39	Message delivered (CHP)
10-40	Is officer...available for phone call?
10-41	Is ambulance needed?
10-42	Dispatch fire rescue
10-43	No ambulance needed
10-44	Doctor needed
10-45	Ambulance needed, injured person
10-46	Ambulance needed, sick person
10-47	Ambulance transfer call, no police needed
10-48	Ambulance transfer call, police needed
10-49	Proceed to...(or) proceeding to...
10-50	Investigate and report
10-51	Drunk
10-52	Resuscitation call
10-53	Person down
10-54	Possible dead body
10-55	Dead (or) dead body (or) dispatch coroner
10-56	Suicide
10-56A	Attempted suicide
10-57	Shots fired
10-59	Security check (of property or a building)
10-62	Return to station for detail
10-63	Prepare to copy (detail or info)
10-64	Advise status
10-65	Missing person
10-66	Suspicious person
10-66P	Suspicious package
10-67	Person calling for help
10-68	Tree down
10-69	Wire down
10-70	Prowler
10-70H	H=HOT (Prowler there, now expedite)
10-71	Shooting
10-72	Stabbing
10-73	How do you copy me?
10-74	Check road conditions
10-75	Check for hole in road
10-76	Check for open ditch
10-77	Check barricades
10-78	Check water conditions
10-79	Check clogged sewer or drain
10-80	Explosion
10-81	Broken water main
10-82	Leaking hydrant
10-86	Any calls for me?
10-87	Meet the officer or unit at...
10-88	Telephone number—file with officer
10-91	Stray animal
10-91A	Vicious animal
10-91B	Animal disturbing the peace
10-91C	Injured animal
10-91D	Dead animal
10-93	ETA
10-94	Drill
10-95	Testing with talking
10-96	Leaving car to investigate, send help if not back in 10
10-97	Arriving at scene
10-98	Last detail completed

Eleven Codes

11-06	Discharging of firearms
11-08	Person down
11-10	Take report
11-12	Loose rocks
11-13	Injured animal
11-17	Wires down
11-23	Vehicle traffic hazard
11-24	Abandoned vehicle, traffic hazard
11-25	Vehicle hazard
11-26	Occupied stalled vehicle
11-27	Suspect has felony record, not wanted
11-28	Rush registration info, driver detained
11-29	No records, no wants
11-40	Is ambulance needed?
11-41	Ambulance is needed, dispatch code (1, 2, or 3)
11-42	Ambulance not needed
11-43	Doctor needed
11-44	Dispatch coroner
11-47	Person injured
11-48	Provide transportation
11-54	Suspicious vehicle
11-65	Signal light out
11-66	Signal out of order
11-71	Fire
11-79	Traffic accident with injuries, ambulance dispatched
11-80	Traffic accident with major injuries
11-81	Traffic accident with minor injuries
11-82	Traffic accident with no injuries
11-83	Traffic accident with no details (usually Code 2 or 3)
11-84	Direct traffic
11-85	Send tow truck
11-86	Special detail
11-94	Pedestrian stop
11-95	Traffic stop
11-96	Leaving car to investigate suspicious vehicle
11-98	Meet with...
11-99	Officer needs help, EMERGENCY

Tuning The Federal Bands On Your Scanner

Settle down and get ready for some fascinating listening, courtesy of your federal government.

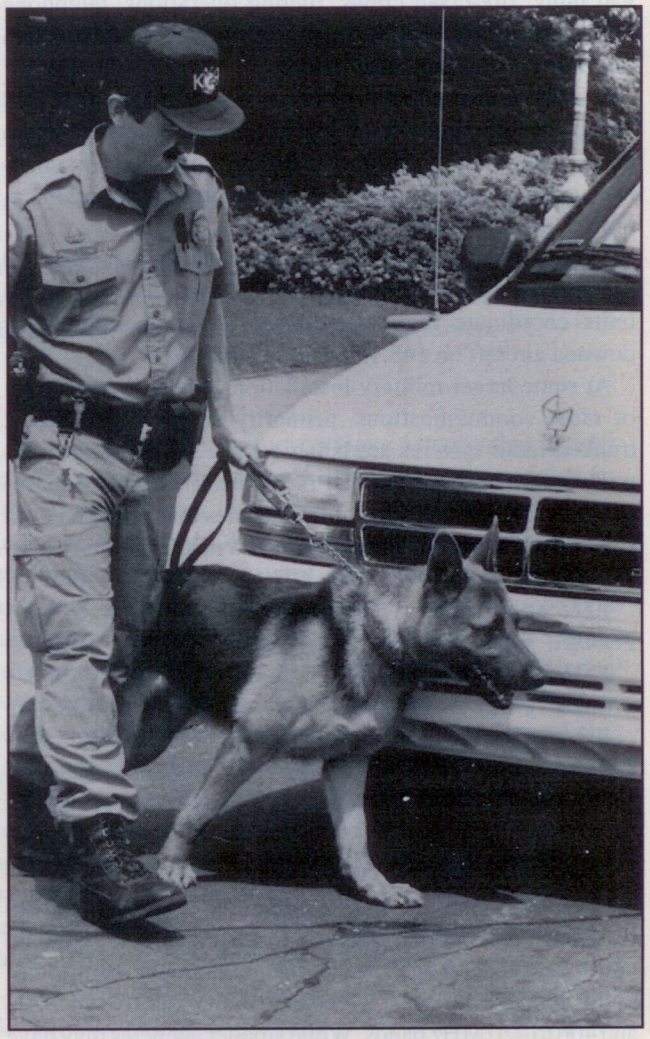
By Chuck Gysi, N2DUP

One of the most interesting users of the scanner bands is the federal government. It's also interesting to note that the U.S. government keeps one of the largest chunks of radio spectrum for its own use.

There are several places to look for federal government and military radio stations in the U.S. and its territories. On the VHF low band portion, U.S. government stations use the following frequency segments: 30.00 to 30.56 MHz, 32.00 to 33.00 MHz, 34.00 to 35.00 MHz, 36.00 to 37.00 MHz, 38.00 to 39.00 MHz, 40.00 to 42.00 MHz, and a few sporadic frequencies nestled among the cordless telephone channels at 46 and 49 MHz. The military also uses a lot of tunable radios, so soldiers may pop up on any VHF low band frequency between 30 and 75 MHz. It isn't unusual to find the army transmitting on frequencies in the 33 MHz band reserved for fire departments, or in the 50 MHz band reserved for ham radio operators.

Other federal government and military bands include 137 to 144 MHz, 148 to 150.750 MHz, 162 to 174 MHz, and 406 to 420 MHz. The military is also the primary user of the 225 to 400 MHz band for aviation and satellite purposes. To hear this band, you'll need to listen in the AM mode for military aircraft and in the narrowband FM mode for satellites.

The VHF low band frequencies between 30 and 50 MHz aren't in wide usage anymore. The Fish and Wildlife Service, however, uses it between 34.81 and 34.83 MHz, and the military can also be found on the VHF low band channels. You can tell when you've stumbled across soldiers using radios because of the tactical calls used to identify stations, such as "Alpha-Tango Two-Six."



A federal government agent uses a trained dog in an investigation. The agent's van is equipped with two-way radios.

The Military

The military is the primary user of the 137 to 144 and 138 to 150.750 MHz bands and of clusters of frequencies around

Two members of the Secret Service Uniformed Division keep watch from a rooftop during a presidential visit. Their activity is coordinated using the VHF walkie-talkies on their hips.

Few federal agents look like this fellow. More likely the agent drives a sports car with concealed two-way radio equipment.

163,165 and 173 MHz. Types of military activities you might hear include military and security police, war games, medical units, fire-crash crews, fueling operations, telephone calls by the brass, even support teams for famous flyers like the Blue Angels and Thunderbirds.

Just above and below the 2-meter ham band at 144 to 148 MHz, you may find MARS operations. No, they aren't from outer space: they're Military Affiliate Radio System channels used by hams who are enrolled to provide communications support services to the military.

Several Navy and Marine Corps installations use 140.100 MHz as a crash net frequency. In addition, Civil Air Patrol units coordinate their search-and-rescue operations for downed aircraft on 148.150 and 143.900 MHz.

At some larger military installations where there is a lot of radio communications, primarily at Air Force bases, trunked radio systems are being set up. These can accommodate several agencies, all on a specified group of frequencies. Here are groups of frequencies that might be used if a trunked system is in operation at a nearby military site:

Trunked group 1—406.350, 407.150, 407.950, 408.750, 409.550, 415.150, 415.950, 416.750, 417.550, 418.350.

Trunked group 2—406.750, 407.550, 408.350, 409.150, 409.950, 414.750, 415.550, 416.350, 417.150, 417.950.

Trunked group 3—406.550, 407.350, 408.150, 408.950, 409.750, 415.350, 416.150, 416.950, 417.750, 418.550.

Trunked group 4—406.950, 407.750, 408.550, 409.350, 410.150, 414.950, 415.750, 416.550, 417.350, 418.350.

Federal Agencies

From the Federal Communications Commission, to National Park Service rangers, to air crash investigators, you'll hear federal agencies on the government's portion of radio frequencies. Most agencies use the 162 to 174 MHz and 406 to 420 MHz bands. While smaller agencies may have only one or a few frequencies, larger agencies can be found on numerous frequencies.

In larger cities, you'll find many federal agencies using two-way radio systems. In more remote areas, you'll hear federal communications only when agents are actually in your community carrying out an investigation.

Where to Search

Here's a look at where some agencies might be found:

FBI—In the past, the FBI could reliably be found in the fol-

lowing segments: 162.6375 to 162.7875; 163.825 to 164.550 and 167.150 to 167.7875. Every FBI field office uses 167.5625 as Channel 4 on a nationwide basis for coordination. In more recent years, the FBI has been found using a wide variety of frequencies between 162 and 174 MHz. They have shown up in the164, 165, 168 and 170 MHz bands. In addition, the FBI formerly used some frequencies in the 412, 414 and 419 MHz band to link its various radio systems.

Secret Service—This agency is charged with dignitary protection, and chasing counterfeiters. Try some of these popular frequencies: 165.7875, channel "Baker"; 165.375, "Charlie," command post; 165.2125, "Mike"; 167.025, "November," White House advance team secondary; 164.8875, "Oscar," motorcades; 164.400, "Papa," counterfeit operations; 166.700, "Quebec," White House staff; 166.5125, "Sierra," presidential protection and White House advance team primary; 164.650, "Tango"; 166.4625, "X-ray," Treasury Department common channel; 162.6875, "Yankee," on-site phone calls mobiles; 171.2875, "Zulu," on-site phone calls base.

FCC—The Federal Communications Commission uses 167.050 MHz on a nationwide basis. You may hear agents tracking down a pirate broadcaster or an illegal transmitter who is causing interference to legitimate radio services.

Customs—The U.S. Customs Service uses 165.2375 and 165.4625 at river ports and airports.

Bureau of Alcohol, Tobacco and Firearms—This catch-all agency deals with smugglers and can typically be heard on the following frequencies: 165.2875, 166.5375, 166.4625 (Treasury Department common) and 165.9125.

U.S. Marshal Service—Keep an ear on 163.200, 164.600 and 162.7125 for possible activity.

IRS—Worried about your tax return? If Internal Revenue Service agents are tailing you, you'll hear them on 165.950. If they're checking up on their own internal affairs, they might use 166.000 and 167.100.

Immigration and Naturalization Service—These units not only keep an eye on the nation's border, but also roam cities looking for illegal aliens. Listen to 162.825, 163.625, 163.650 and 163.675.

General Services Administration—This agency uses radios for protective details in federal buildings. VHF channels include163.0625 to 163.175; UHF channels include 415.200 and 417.200.

Army Corps of Engineers—Whether designing a dam or rerouting a stream, the Corps uses 163.4125 and 163.4375.

Federal prisons—Security uses 170.875, emergencies are handled on 170.925, and tactical operations are conducted on 170.650.

National parks—Rangers and support staff typically use 164.4125 to 164.475, 164.725 to 164.800, 165.000 to 165.1875, 166.325 to 166.350 and 166.725 to 166.975.

Coast Guard—While 165.2625 is used for communications, you can hear emergency VHF Marine Channel 16 relayed from remote sites to Coast Guard offices on 165.3125, 171.3375 and various frequencies in the 406-420 MHz band.

Environmental Protection Agency—If there's a spill, you might hear EPA staffers and helicopters on 165.4125.

Federal Aviation Administration—FAA units use 169.250 to169.375. Also interesting is 165.750, which National Transportation Safety Board air crash investigators use.

Veterans Affairs—This agency operates health-care facilities for veterans in almost all areas of the U.S. Most paging, security, and medical operations occur on 163.000, 164.175 and 168.525.

Weather Broadcasts—The National Weather Service, in conjunction with the National Oceanic and Atmospheric Administration, broadcasts 24 hours a day on any of the following frequencies in your area: 162.550, 162.400, 162.475, 162.425, 162.450, 162.500 and 162.525.

Of course a complete listing of the frequencies used by federal agencies would be beyond the scope of this article. But the sampling presented here should provide you with a good overview of how the federal government divvies up its share of the radio spectrum. ■

GLOSSARY

VHF low band—typically frequencies that fall between 30 and 50 MHz.

MHz—megahertz, the measurement in which most VHF and UHF frequencies are given (as in this article).

2-meter ham band—the band from 144 to 148 MHz used by amateur radio operators.

Trunked—a radio system that has multiple-channel capacity and assigns users to a designated channel each time they access the radio system.

AM mode—amplitude modulation, typically used by aircraft in the VHF and UHF bands.

Narrowband FM mode—frequency modulation, the mode (or method of transmission) by which most radio users use in the VHF and UHF bands.

Field office—an office set up by a federal government agency in a town or city to enable the agency to carry out investigations in the general area around the office.

In Review: The Radio Shack PRO-51

By Dave Marshall, N8OAY

The PRO-51 (Radio Shack #20-308) is the newest portable scanner available at Radio Shack, replacing the PRO-39 (although the latter may still be available in some stores). Covering all the popular scanner frequencies, the PRO-51 is a good performer.

Thanks for the Memories

The scanner's 200 memory channels are arranged in 10 banks of 20 channels each, and there are also 10 special monitor memory channels. The amber backlit LCD display shows all functions of the scanner—here's a display that's easy to read!—and a keypad of 25 keys, along with the volume and squelch knobs on top, control and operate the scanner.

The PRO-51's 10 memory banks are controlled by the keys labeled 1 through 0. The numbers of the channels in each bank are marked in small white numbers above each key, that is, numbers 1-20 appear above key 1, 21-40 above key 2, and so on. Pressing any of the 1 through 0 keys while the scanner is in the SCAN mode activates or de-activates the respective bank.

The 10 special monitor memory channels are set aside for temporary storage of frequencies found while using the search feature. The frequencies stored in the monitor memories can be transferred to one of the 200 permanent memory channels after ending the search activity.

The PRO-51 also offers a keypad lock-out to prevent accidental program changes. The lock-out on this scanner functions differently from those on other scanners I have seen. The keylock on many other scanners is a slide switch that can itself be moved accidentally when carrying the scanner on your belt. The keylock on the PRO-51, however, is a key that must be pressed and held for 2-3 seconds to activate or de-activate the lock-out.

And, oh, the Features

There are three ways of searching for unknown active frequencies. One method, "Limit Search," allows the user to search back and forth between two specific frequencies. Lower and Upper Limit frequencies are programmed and then the search is initiated by pressing either the up or down arrow keys. The search will continue between the two limits until the user stops it. For instance, you might search the VHF-low fire band by programming 33.440 MHz for the lower limit and 33.980 MHz for the upper limit. Pressing one of the arrow keys will start the search, which will run continuously between 33.440 and 33.980, stopping on any active frequencies. When the transmission ends, the search goes on. While the search is stopped on an active frequency, pressing the MON key will store the frequency in one of the temporary monitor memories.

The amber backlit LCD display shows all functions of the PRO-51.

The second method of searching is the "Direct Search." This lets the user search up or down from any frequency in memory by selecting any memory channel and then pressing the up or down arrow key. The difference between "Limit" and "Direct" Searches is that a direct search runs through the entire frequency range of the scanner, while a limit search runs between two programmed limits. Again, any active frequencies can be stored in the temporary monitor memory channels for later transfer to permanent memory.

The third method of searching has been a popular feature for many years on some base/mobile scanners, but is quite new for portable scanners. The PRO-51 has four pre-programmed search bands: Aviation, Fire, Marine and Weather. This search is activated by pressing first the BAND key and then one of the respective keys for the pre-programmed bands. Using these bands makes the search process much

PRO-51 Band Coverage

29 to 29.7 MHz 10 Meter Ham
29.7 to 50 MHz VHF-low
50 to 54 MHz 6 Meter Ham
108 to 137 MHz Aircraft (AM)
137 to 144 MHz Federal Government/Military
144 to 148 MHz 2 Meter Ham
148 to 174 MHz VHF-high
406 to 420 MHz Federal Government/Military
420 to 450 MHz 70 Centimeter Ham
450 to 470 MHz UHF
470 to 512 MHz UHF-T
806 to 956 MHz Public Service
(Note that 824 to 850 MHz and 869 to 896 MHz Cellular Phone bands are deleted.)

easier. The Fire band, for instance, covers all frequencies allocated for fire use in the VHF-low, VHF-high and UHF bands. As with the other two types of search, active frequencies can be stored in the temporary monitor memory channels for later transfer to permanent memory.

The PRO-51 scans at a rate off 50 channels per second. In the past, I've been skeptical of scanners that operate at such a high speed (for a long time, the "industry standard" seemed to be 16 channels per second). Most previous high-speed scanners seemed to skip over many of the weaker signals, but the PRO-51 appears to have solved that problem.

The scanner also has a priority channel that can be programmed for *any* of the 200 memory channels. When activated, the priority channel is checked every two seconds for activity, regardless of what the scanner is doing. If activity is found, the scanner will switch to the priority channel until the activity ends, at which time the scanner will resume whatever it was doing.

Some Vital Statistics

The audio output is 250 milliwatts into an 8 ohm, 1.4 inch speaker, and is slightly weak compared to older products. So, if you're planning to use the PRO-51 for long periods of time in a car or truck with your windows rolled down, you might want to consider using an amplified extension speaker, such as Radio Shack's 21-541 (which sells for $24.99).

The PRO-51 uses four AA batteries, either alkaline or rechargeable. A fully charged set of high-capacity rechargeable NiCd batteries yielded an average of 15 hours listening time. But, in reality, your listening time will vary depending on activity, volume setting, and display light usage. To use rechargeable batteries, you'll have to purchase the AC Adapter/Charger (#20-188, $6.99) which can also be used to operate the scanner from your house wiring.

Overall, I am very pleased with the Radio Shack PRO-51 portable scanner (which sells for $299.95). I'd recommend it for anyone who does not require access to the 225 to 406 MHz UHF Military Aircraft band. ■

Hams: Taking your 2-meter HT on the road? Here's

More Power "2" You!

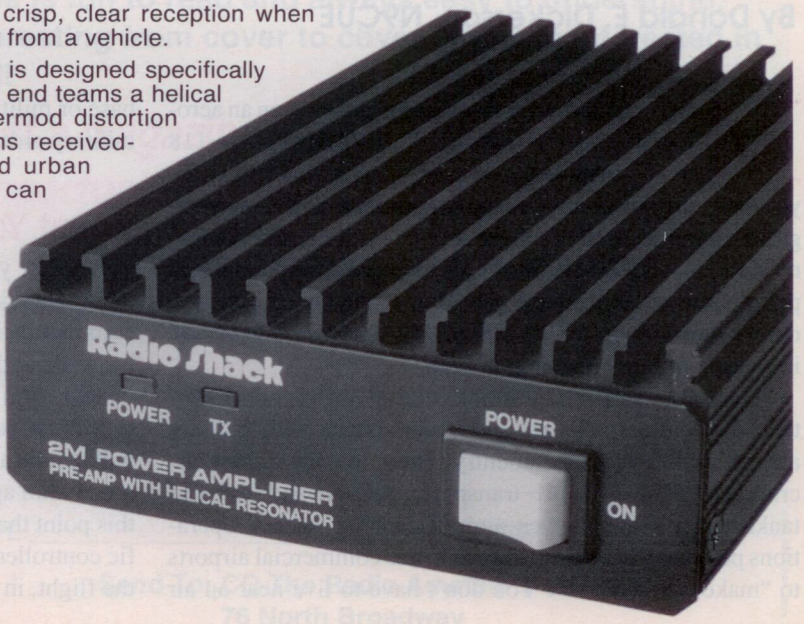
Now you can boost your signal and enjoy crisp, clear reception when operating your 2-meter handheld transceiver from a vehicle.

Radio Shack's new 2-meter power amplifier is designed specifically for mobile use. Its superbly engineered front end teams a helical receive filter that dramatically reduces intermod distortion with a compensating preamp that maintains received-signal strength. It's ideal for RF-crowded urban areas where multiple out-of-band signals can create annoying interference.

This 1 3/8 x 3 15/16 x 6 1/8" powerhouse accepts 0.5 to 5 watts input and outputs a full 30 watts—plenty of power to carry you to distant repeaters. Team it with Radio Shack's HTX-202 transceiver and 5/8-wave magnetic-mount antenna and you've got a mobile rig that's hard to beat!

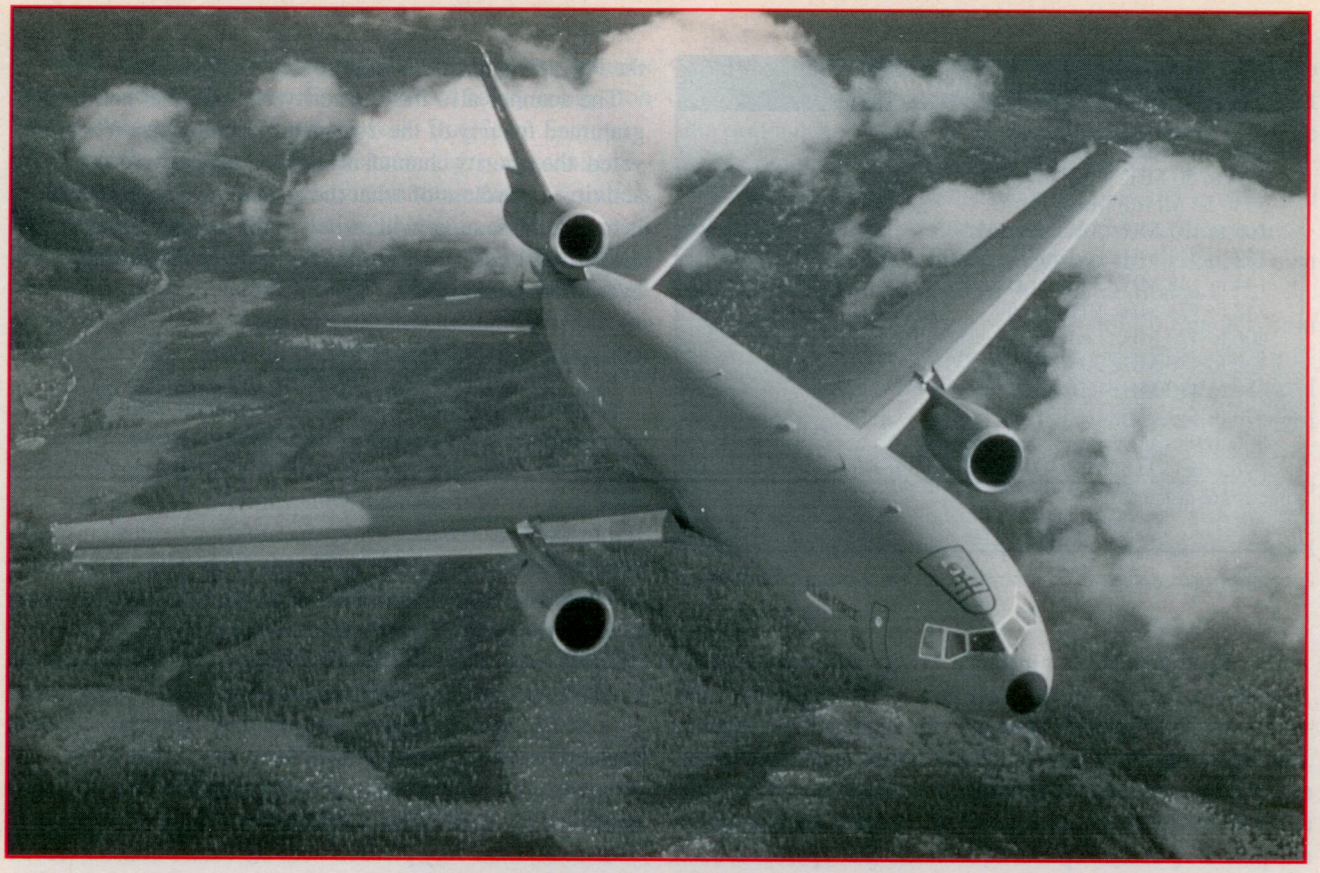
Get the most from your HT today with the 2-meter power amplifier, just $119.99.

For 2-meter VHF (144-148 MHz) band, FM only. Requires 13.8VDC.



Radio Shack®

You've got questions. We've got answers.℠



Listening To The Military Airband

From fighter aircraft to military transports, this band offers some of the most exciting listening around.

By Donald E. Dickerson, N9CUE

Many scanners offer fascinating listening on an aeronautical band or airband. This is found in the 118 to 137 MHz range on your scanner, and it's where you hear airport control towers, approach and departure, ground control, ARINC, flight service stations, and company stations talking to pilots of all kinds of commercial and private aircraft. But, when choosing a scanner, if you also opt for one with the 225 to 400 MHz range, you'll get some intriguing military listening as well.

These same commercial airports and air traffic control centers also routinely control and communicate with military aircraft as they cross the country. These include fighter aircraft, C-130 and C-141 transports, KC-10 and KC-135 tankers, spy planes—even aircraft carrying special operations personnel have been known to use commercial airports to "make connections"! You don't have to live near an air base or military installation to know what's going on in the military airband.

What You Can Hear

Whether you are listening to radio traffic from a military or commercial airport, the air traffic controller will maintain communications with and control of the aircraft until it has been cleared. After takeoff, when the aircraft is approximately 25 miles away from the airport, the pilot will switch to a flight service station or a sector control station. They will handle any radio communications from the aircraft until it is within approximately 15 miles of its destination. It is at this point that the final approach is picked up by the air traffic controllers in the tower, just prior to landing. Each leg of the flight, in the case of commercial aircraft, will have used

C-141 transport aircraft are frequently heard on the military airband. (Photo courtesy Department of Defense.)

This AWACS uses the military airband and radar to control military airspace during maneuvers. (Photo, below, courtesy Department of Defense.)

a different frequency, one for departure, one for in-flight and one for final approach. Military airfields use the same techniques.

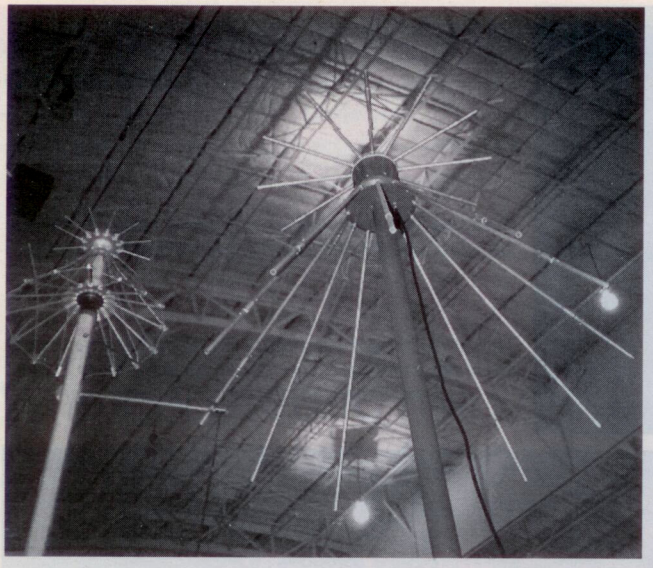
You will generally be able to hear aircraft as far away as 200 miles from your location. Air-to-air communications can be conducted up to 500 miles depending upon the altitude of the two aircraft.

Military air traffic control is handled differently during maneuvers. When fighters go into action, whether from an air base, naval station or aircraft carrier, they will, depending upon the mission, have an E-2C or an AWACS (Airborne Warning and Control System) aloft first. The E-2C is smaller than the AWACS and is carried by all aircraft carriers for naval operations. The E-2C is capable of providing long range radar coverage and data relay between air-to-ground and air-to-air. It can simultaneously track over 600 targets while in flight and actually control over 40 aircraft. Its radar coverage extends up to 300 miles. The AWACS is an EC-135 and is the military version of the 707 aircraft. It has considerably greater range and capabilities than the E-2C. Both the EC-2 and AWACS are literally flying air traffic control towers with a minimum of five air traffic controllers on board.

Air Force One.

The AWACS and E-2Cs provide radio and radar coverage for our fighter aircraft in their control area. Their long range radar can tell where enemy aircraft are and where they are headed. This enables our fighters to plan an attack, adding a great deal of safety to our air operations. These aircraft also relay voice and data communications back to command centers or aircraft carriers.

What will you hear on the military airband? Well, you might hear fighter and bomber pilots making strafing and bombing runs at an ammunition proving grounds. You might hear a KC-10 or 135 tanker refueling fighters or helicopters on routine missions or special operations and various air emergencies. For instance, one military transport overheard several years ago reportedly requested fire equipment be set up on the tarmac. Apparently, the victim of what appeared to be a chemical accident needed to be hosed down imme-



Even the Air Force uses discone antennas. This photo shows military discones on a communications security radio intercept van.

diately upon leaving the aircraft. You just never know what you'll hear next on the airband!

The media has also conducted its reporting over airband communications through the years. One intercepted report was then President Ronald Reagan ordering the shooting down of Libyan jets from his telephone aboard Air Force One. That's real news in the making!

A Look at "Looking Glass"

Looking Glass is the name of the Air Force system of airborne command posts which will be placed in operation in a national emergency. For over 30 years, these planes used to fly continuously (24-hours a day), but with the end of the Cold War and breakup of the Soviet Union, this practice has stopped. They do, however, still engage in maneuvers and can be heard on HF, VHF, and UHF frequencies. The Looking Glass network consists of 37 R/EC-135s (707s) each capable of relaying the order to launch nuclear weapons and control our bombers! The Navy version of this system consists of 15 C-130 aircraft that would relay the launch commands to our submarine fleet, if necessary. This Navy system, known as Take Charge and Move Out (TACAMO), is part of our country's National Command Authority (NCA) whose authority originates with the President. Should the President choose to leave Washington, D.C. during a nuclear attack or national emergency, he could board a 747 command post called the National Emergency Airborne Command Post (Kneecap).

Kneecap, unlike Air Force One, has the flexibility needed to communicate with all military forces through a variety of communications channels: VLF (Very Low Frequency), HF (High Frequency), VHF (Very High Frequency), UHF (Ultra High Frequency) and satellite. Most high priority communications will be encoded during a national emergency. This means your scanner will only hear noises, beeps, tones and other sounds that are impossible to interpret. At most other times, however, you will be able to hear some routine traffic from any aircraft within range of your station if you are tuned to the right frequency.

Key Words Used In This Article

ARINC—Aeronautical Radio Inc. A commercial radio service that operates HF and VHF channels for commercial airlines for a fee.

AM—Amplitude modulation was the first method of superimposing a voice or modulation on an electronic signal. Still the mode used in airband communications worldwide on VHF and UHF.

AWACS—Airborne Warning and Control System. This is an Air Force plane, often a 707 (EC-135) used to control military air space during maneuvers via radio and radar. The smaller E-2C is the Naval version which flies from carriers.

FM—Frequency modulation is a method of superimposing a voice onto an electronic signal by varying the frequency instead of the amplitude of the signal. FM is the standard mode for VHF/UHF military and public safety stations.

Kneecap—The acronym for the National Emergency Command post. It is the plane that would be used by the President during a national emergency or war. All military communications and command functions can be carried out by this 747 aircraft.

Looking Glass—Is the name of the Air Force fleet of airborne command posts. The network consists of 37 EC-135's (707s).

NCA—The National Command Authority originates with the President of the United States and extends to all military forces. Our military satellites have special channels just for special orders from the President.

TACAMA—A Navy acronym for Take Charge and Move Out. This is the Naval equivalent of Looking Glass. It consists of fifteen C-130 command posts that would communicate directly with our nuclear missile submarines.

Air Force One

While we're on the subject of presidential communications, let's look at some Air Force One frequencies. Air Force One operates on two bands. It routinely operates in the Federal Band, which is from 406 to 420 MHz. Three primary frequencies are used: 415.700, 411.700 and 407.850 MHz. Air Force One has also been known to operate in the military airband on 305.550, 361.0 and 397.050 MHz. You can also listen for Air Force One communications as it takes off or lands at commercial airports using arrival/departure frequencies common to that facility.

Looking a Little Higher

If you want to look higher, specifically 200 miles high, you will find another user of the 225 to 400 MHz band—the Space

A Sampling of 225 - 400 MHz Airband Frequencies (in MHz)

Navy	Air Force	Refueling
233.7	276.1	295.8
239.2	278.4	297.3
244.3	283.8	314.5
246.8	288.9	322.6
249.8	299.5	339.2
251.6	311.0	342.1
255.0	312.8	352.6
266.7	313.6	361.0
267.8	318.3	366.3
285.0	321.0	375.7
307.4	338.5	378.2
308.5	342.2	385.6
369.9	361.4	396.2

Air Force	Refueling	Air Force One
228.4	235.1	260.30
235.1	238.9	305.550
238.7	242.4	322.8
239.2	259.8	390.0
251.6	264.9	392.6
254.6	266.4	398.0
255.8	270.1	407.880
258.3	276.1	411.700
260.4	205.9	415.700
264.6	286.3	**Space Shuttle**
270.6	291.9	259.7
273.1	293.0	279.0
		296.8

Shuttle. The Shuttle uses three frequencies in this band: 259.7, 279.0 and 296.8 MHz. These are used during space walks or Extra Vehicular Activity (EVAs). The astronauts wear self-propelled space suits when working outside the shuttle. These suits have radios which use these three frequencies and they carry the 243.0 MHz emergency channel too. These radio signals will be in the FM mode and use low power (so, I suggest a discone or some other outside antenna). If the space station Freedom becomes a reality, the construction will require long hours in space and that means there will be plenty of voice communications. This should prove to be a great opportunity to scan these frequencies as the project develops and additional shuttle missions begin.

What You Will Need

As in the commercial airband, military airband communications are in the AM mode, unlike most public safety radio systems which are in FM. Keep this in mind when you purchase a scanner. You should also consider if, in the future, you may want to try to hear any of the numerous FM voice signals on military satellites. If so, you will want a scanner with a selectable mode (AM or FM) in the 225 to 400-MHz band. Check the specifications carefully.

A Sample Listing of Military Frequencies At Commercial Airports

Chicago Center	319.8
257.9	321.3
284.7	385.4
285.5	
351.7	**Jacksonville Center**
	269.2
Denver Center	327.1
272.7	
281.5	**Miami Center**
282.2	269.0
296.7	270.3
306.9	
	Minneapolis Center
Fort Worth Center	319.2
317.4	323.1
360.6	353.7
364.8	Seattle Center
377.1	306.2
	343.6
Indianapolis Center	
290.3	

(Courtesy Tom Kneitel "Top Secret Registry")

As with any good monitoring station, an outside antenna is recommended. The discone antenna's unique design makes it a good choice for airband reception. Any outside vertical antenna will work well for you.

I've included frequency lists to get you started in military airband listening. These are just introductions to the band. There are a zillion channels you will want to search with your scanner between 225 and 400 MHz. Finding out for yourself what frequencies are used in your area and always being on the lookout for new ones is just part of the fun. ■

Of course, your next question may be, "Isn't there some way to get an exhaustive list of military airband frequencies used at each military and commercial airport?" Fortunately, there is a single publication that can provide you with just this kind of specialized information. The book is *The Top Secret Registry of U.S. Government Radio Frequencies.* It's written by Tom Kneitel and published by CRB Research. In it you will find complete frequency lists for each military base in the country. Not just airband, but all frequencies used at that facility. This impressive volume also gives you a list of the major air control centers and the military and commercial frequencies used there. In addition, you get a list of government frequencies beginning with 25 MHz and going up to 500 MHz. For more information write CRB Research, P.O. Box 56, Commack, NY 11725. Another excellent publication is the *Aeronautical Frequency Guide*, available at your local Radio Shack store (catalog number 62-1030). It covers HF, VHF and UHF aviation frequencies along with domestic and international designators.

All photos by Dave Marshall.

Norfolk & Western #611 on its first trip through Ohio after restoration.

Monitoring The Railroads

Let's ride the rails—and bring your handheld scanner for tons of fun.

By Dave Marshall, N8OAY

Few means of travel can match the railroad's mystique for history and adventure. Our past is filled with stories and figures that developed into legend, like railroad barons and fast-shooting train robbers. Today, armed with only your handheld scanner, you can get closer than you've ever been to the excitement of the rails.

In North America, most railroads use frequencies in the 160-161 MHz frequency range, along with some frequencies in the UHF range. Others, like railroads owned and operated by major industries, railroad museums, and amusement parks, may be found operating on business band frequencies. Some mass transit commuter lines in large cities may use local government frequencies instead of, or in addition to, the normal railroad frequencies.

So why not join us now as we take our scanner along to follow a train from the beginning to the end of its journey. When we're finished, you'll understand the meanings of some of the communications you'll hear when you, too, listen to the railroads.

The Ride Begins

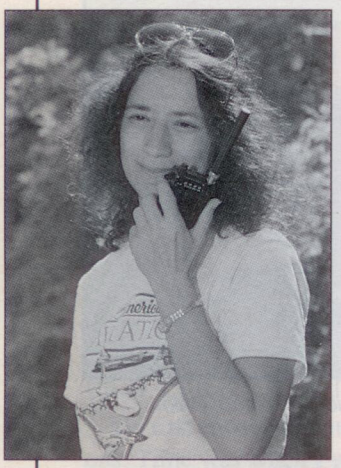
Our train is assembled in the yard by a switch engine that pulls one car, or a block of cars, from the classification tracks and shoves them into an empty track. In the larger rail yards, these switchers have their own radio channel, which is usually called *pulldown*. In another part of the yard, car inspectors are checking the cars and looking for any repairs that might be needed. If any safety or mechanical problems are found, the car will be sent to the yard's car shop for repairs. In most yards, the car inspectors and the car shop will each have their own radio channels.

One Size Fits All!

Amateur Radio

If you want to get in on the fun and excitement of personal radio communications—from talking to friends across town, to making new friends in dozens of foreign countries—Amateur Radio is for you!

More than two million people around the world share a fascination with the diversity and friendships Amateur Radio brings to their lives. Amateur Radio is a multifaceted method of communication that fits every lifestyle.



Who are these Amateur Radio enthusiasts? Kings, country western singing stars, senior citizens, astronauts, school children, mechanics and homemakers, to name just a few. Anyone can enjoy Amateur Radio, regardless of age, gender, occupation or physical ability.

The best part about Amateur Radio is that there are so many activities to explore—finding your perfect fit is half of the fun. You can operate a two-way radio station from your easy-chair, computer, car, boar, camper or even from a mountaintop! It's two-way mobility with a capital "M."

Amateur Radio is fun and convenient—and it's great for emergencies. You can talk to other hams (Amateur Radio operators) across town, across the globe and even beyond. Ever imagine talking to an astronaut in orbit or bouncing a signal off the moon and back? Amateur Radio operators do it every day—and you can, too.

Finding out how you can get started in ham radio couldn't be easier. We're the American Radio Relay League, the largest Amateur Radio membership organization in the country, and we've been helping hams (and future hams) get started for more than 75 years. We'll help you, too.

A great way to get more acquainted with Amateur Radio, or enhance your ham radio enjoyment if you're already licensed, is membership in the ARRL. In addition to invaluable services, benefits and access to dozens of specialized ham radio books, each month you'll receive your membership journal, *QST*. Weighing in at more than 200 pages per issue, *QST* is packed with Amateur Radio news, features, operating tips, technical advice *and* a very special section for beginners: *New Ham Companion*. You'll get the whole picture—everything that's going on in the amateur community, and you'll be able to take advantage of everything Amateur Radio has to offer.

Getting Started Now: Two Roads to Success

Getting started in Amateur Radio is as simple as calling the toll-free number shown below.

The easiest way to get the "ball rolling" is to ask for our free "Getting Started in Amateur Radio" package. Included is all the information you need to find out about how you can get on the air with your own ham radio station.

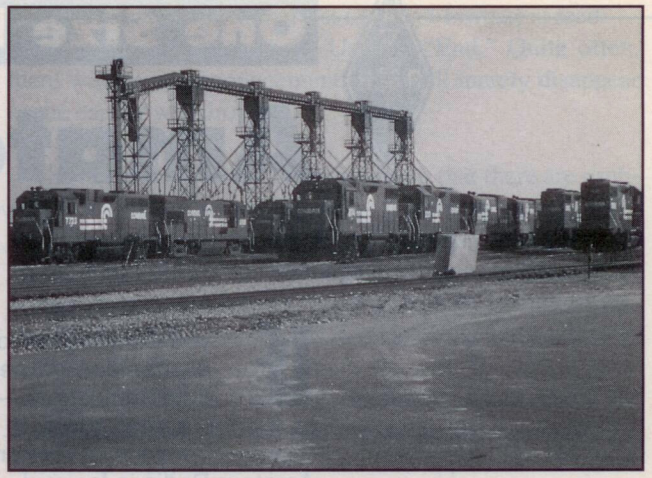
If you're already a ham—or think that you want to be!—call the toll-free number and sign up for a 1-year ARRL Membership. Membership in the American Radio Relay League—the national organization of Amateur Radio operators—is an invaluable help in getting a good start in ham radio. As an ARRL Member, you'll expand your Amateur Radio horizons with expert information on virtually every Amateur Radio topic and enjoy membership services tailored to your needs as a new ham.

So, what are you waiting for? Call today. The fascinating world of Amateur Radio awaits!

Call 1-800-32-NEWHAM

AMERICAN RADIO RELAY LEAGUE ■ 225 MAIN STREET ■ NEWINGTON, CT 06111-1494
203-666-1541 (voice) ■ 203-665-7531 (fax)

Amtrak's Lake Shore Limited (right) and Lake Cities (left) at Toledo Union Station in Toledo, Ohio.



The locomotive fuel and sand facility at Conrail's Buckeye Yard located in Columbus, Ohio.

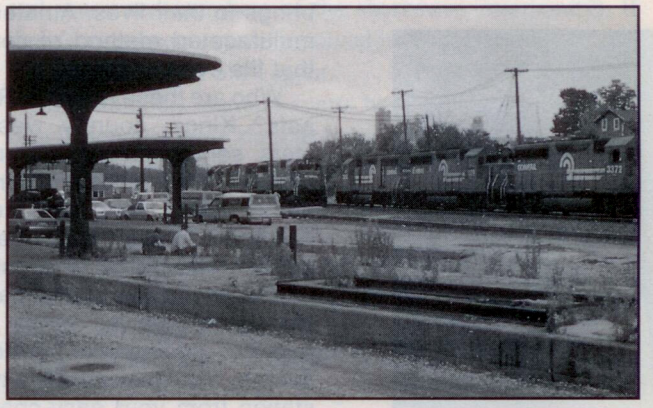
A few minutes before the train is ready to go, the train crew will be transported to the front locomotive by a company vehicle, known as a *crew cab*, *taxi*, or *limo*. The crew cabs often have their own radio channel. By the time the crew arrives, a *hostler* will have brought the locomotives from the fueling line and coupled them to the train (yes, hostlers, too, usually have their own radio channels).

Our engineer then inspects the engine and runs an air brake test to ensure everything is in working order. When these tests are complete, the engineer or conductor will call the *yardmaster* on the yard radio channel and okay the train to leave the yard. The yardmaster lines up the track switches and gives the train a signal to proceed. The engineer or conductor next contacts the main line dispatcher on the railroad's primary, or *road* radio channel for permission to leave the yard. We're now ready to enter the main line.

Once out on the main line, radio communications are few and far between on lines with automatic signal control. But, on the larger branch lines and in the smaller railroads, the train crew must contact the dispatcher more often to update the railroad of the train's progress and to get permission for some movements.

At regular intervals as we continue on the main line, the train encounters automatic, or "talking" defective equipment detectors. The two primary types of these devices are known as *hot box detectors* and *dragging equipment detectors*. The hot box detectors are designed to find over-heated wheel bearings, and the dragging equipment detectors locate objects hanging from the bottom of the train's cars, such as dangling air brake lines, that could cause problems.

These detectors are equipped with a radio on the main road channel that transmits to the train using a synthesized or recorded voice message. A typical message we might hear will give the name of the railroad and type of detector, the location (either by town name or milepost), a total axle count, the track number (if it's on a multi-track line), and whether or not any problems were found. If a problem is found, the detectors tell the train crew which side of the train the problem is on and how far back from the front of the train by axle



Two trains meet at Airline Junction in Toledo, Ohio.

count. The detector then indicates that the message is completed and, in some cases, transmits a "safety" message. The train crew is required to stop and perform a visual inspection if any defect was indicated.

The detectors are located every 20 to 30 miles on the main line and can usually be heard as far as 10 to 15 miles away, depending on terrain. For the railfan and scannist, they indicate the location of the train. On some railroads, the train crew must also call out signals as they pass them as a safety measure. This call also helps railfans find a train, as the signals are called either by name or milepost location.

Other Rail Communications

Most other communications on the main road channel are routine and sometimes self-explanatory. We may hear a request for clearance to cross another railroad's tracks, as another train might be approaching the crossing. We may hear a clearance request to pass a dysfunctional signal, or instructions to wait in a siding (on single track lines) for an oncoming train to pass, or perhaps a warning to track and signal maintenance crews of our approach. You'll hear more communications from "local" trains that drop off and pick up cars at the various industries along the line.

As our train approaches its destination, the crew receives permission to enter the yard and stop the train on an "arrival" track. A crew cab picks up crew members and takes them to the office. A hostler then removes the engines to the service and fueling area. Finally, the train will be broken up into individual or blocks of cars to be switched into other trains. To accomplish this task in larger yards, a *hump engine* pulls the train out of the arrival track and pushes it over a hump, where the cars are uncoupled and gravity takes over to switch them into the various classification tracks. Then the process already described starts again for a new train.

In most yards, the crew on the hump engine has its own radio channel. Other radio channels may be used for administration, mechanical shops for the engines, a second hump crew (in the really big yards), track and signal maintenance, and railroad police.

In addition to all of these, there's usually one other channel used by modern trains. As you've probably noticed, most trains now run without a caboose, which means the entire train crew must ride in the engine. Trains now carry an *End of Train Monitor (EOTM)* to transmit data on brake system air pressure and direction of movement to the front of the train. On most railroads, these devices use 457.9375 MHz (an exception is Norfolk Southern Railroad, which uses 161.115 MHz). These EOTMs normally use 3- to 5-watt transmitters. Although you'll have no way of decoding the information transmitted by an EOTM, its steady string of data tells the railfan scannist of a nearby train.

Some railroads are now being licensed for trunked radio systems in the 900 MHz band. The systems will probably replace the many individual channels presently used in the major yards for administration, car and engine shops, etc. These new systems will probably also replace the PBX (Private Branch Exchange) mobile telephones used by railroads.

"Fill 'er up, check the oil, and get that windshield!"

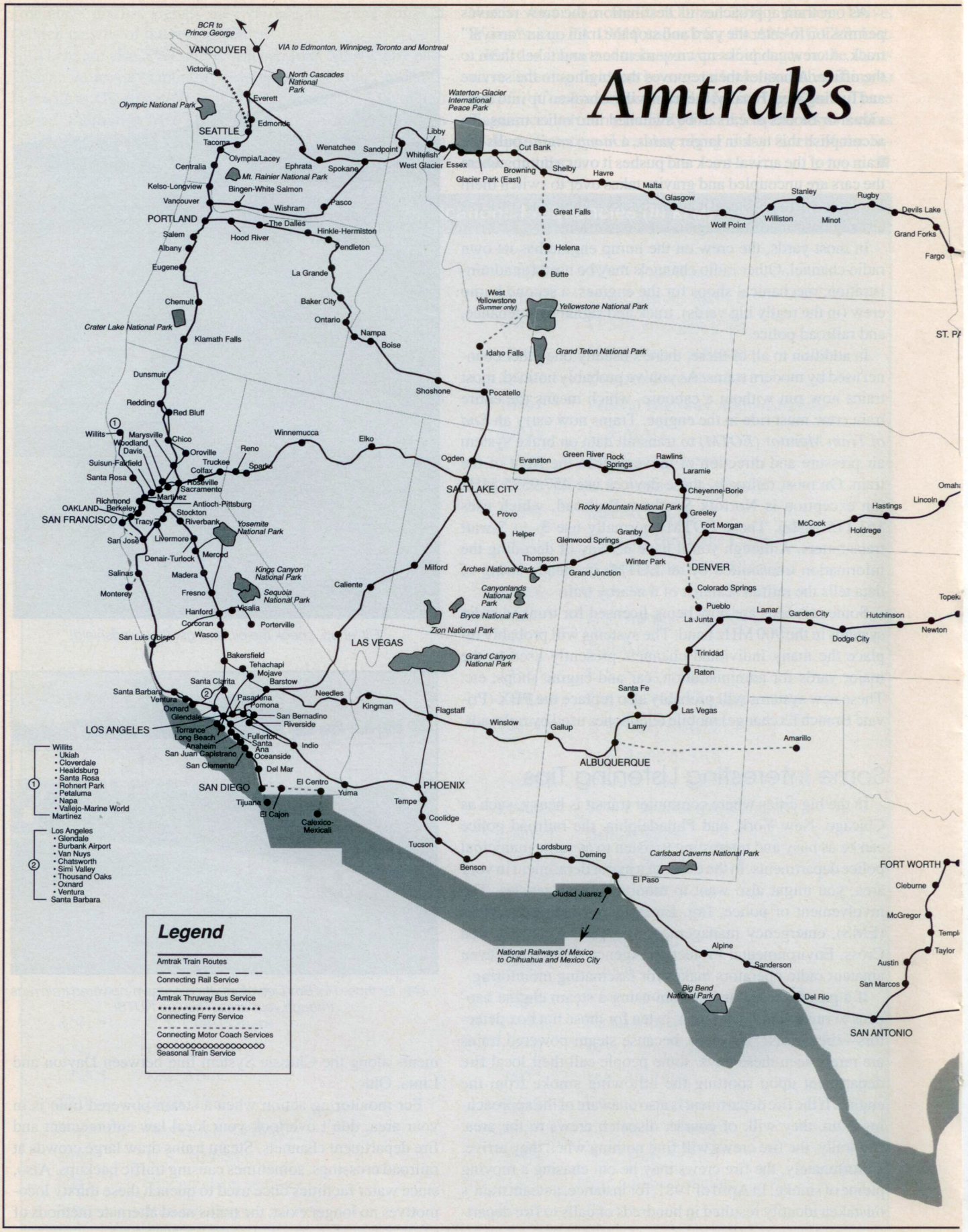
Some Interesting Listening Tips

In the big cities where commuter transit is heavy, such as Chicago, New York, and Philadelphia, the railroad police can be as busy and interesting to listen to as some municipal police departments. In the event of a major derailment in your area, you might also want to monitor other agencies. The involvement of police, fire, Emergency Medical Services (EMS), emergency management agencies, American Red Cross, Environmental Protection Agency (EPA), and even amateur radio operators makes for fascinating monitoring.

If a passenger excursion train using a steam engine happens to run through your area, listen for those hot box detectors—they go NUTS! Also, because steam-powered trains are rarely seen these days, some people call their local fire department upon spotting the billowing smoke from the engine. If the fire department is also unaware of the approaching train, they will, of course, dispatch crews to the area. Naturally, the fire crews will find nothing when they arrive. Unfortunately, the fire crews may be out chasing a moving plume of smoke! In April of 1981, for instance, a steam train's mistaken identity resulted in hundreds of calls to fire departments along the Chessie System line between Dayton and Lima, Ohio.

Listen for those Hot Box Detectors when a steam-powered train runs through your area. They go NUTS!

For monitoring action when a steam-powered train is in your area, don't overlook your local law enforcement and fire department channels. Steam trains draw large crowds at railroad crossings, sometimes causing traffic backups. Also, since water facilities once used to quench these thirsty locomotives no longer exist, the trains need alternate methods of

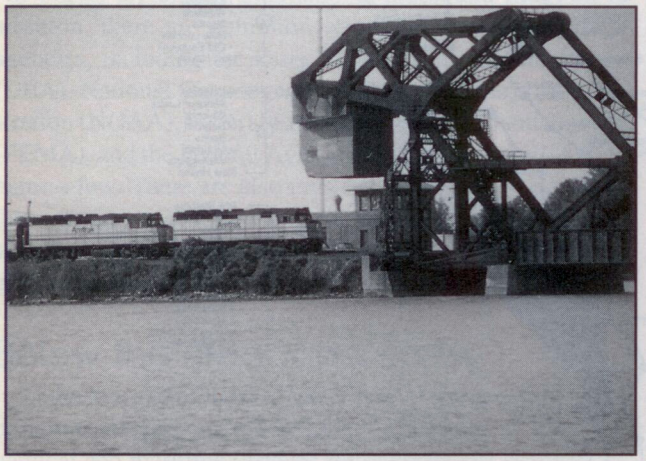

Amtrak's
BCR to Prince George
VANCOUVER
VIA to Edmonton, Winnipeg, Toronto and Montreal
Victoria
North Cascades National Park
Olympic National Park
Everett
Waterton-Glacier International Peace Park
SEATTLE
Edmonds
Tacoma
Wenatchee
Sandpoint
Libby
Whitefish
West Glacier
Essex
Cut Bank
Olympia/Lacey
Ephrata
Spokane
Centralia
Mt. Rainier National Park
Browning
Shelby
Havre
Glacier Park (East)
Kelso-Longview
Bingen-White Salmon
Malta
Glasgow
Stanley
Rugby
Vancouver
Wishram
Pasco
Great Falls
Wolf Point
Williston
Minot
Devils Lake
PORTLAND
The Dalles
Hinkle-Hermiston
Grand Forks
Salem
Hood River
Pendleton
Helena
Fargo
Albany
Eugene
La Grande
Butte
West Yellowstone (Summer only)
Yellowstone National Park
Chemult
Baker City
Ontario
Crater Lake National Park
Nampa
Klamath Falls
Boise
Idaho Falls
Grand Teton National Park
Dunsmuir
Shoshone
Pocatello
Redding
Red Bluff
Willits
Marysville
Chico
Winnemucca
Elko
Woodland
Davis
Oroville
Reno
Ogden
Evanston
Green River
Rock Springs
Rawlins
Laramie
Suisun-Fairfield
Truckee
Sparks
Colfax
Santa Rosa
Roseville
Sacramento
SALT LAKE CITY
Cheyenne-Borie
Richmond
Martinez
Antioch-Pittsburg
Rocky Mountain National Park
Greeley
Hastings
Lincoln
OAKLAND
Berkeley
Stockton
Provo
Fort Morgan
McCook
Holdrege
SAN FRANCISCO
Tracy
Riverbank
Yosemite National Park
Helper
Granby
Glenwood Springs
San Jose
Livermore
Merced
Denair-Turlock
Thompson
Winter Park
Grand Junction
DENVER
Salinas
Madera
Kings Canyon National Park
Arches National Park
Milford
Caliente
Monterey
Fresno
Sequoia National Park
Canyonlands National Park
Colorado Springs
Visalia
Pueblo
Lamar
Garden City
Hutchinson
Hanford
Bryce National Park
La Junta
Corcoran
Porterville
Zion National Park
Dodge City
Newton
San Luis Obispo
Wasco
LAS VEGAS
Trinidad
Bakersfield
Grand Canyon National Park
Tehachapi
Raton
Mojave
Santa Clarita
Barstow
Santa Fe
Santa Barbara
Ventura
Needles
Kingman
Las Vegas
Oxnard
Pasadena
Pomona
Flagstaff
Glendale
San Bernadino
Winslow
Gallup
Lamy
Amarillo
LOS ANGELES
Torrance
Riverside
Long Beach
Fullerton
Anaheim
Santa Ana
Indio
ALBUQUERQUE
San Juan Capistrano
Oceanside
San Clemente
Del Mar
SAN DIEGO
El Centro
Yuma
PHOENIX
Tijuana
El Cajon
Tempe
Calexico-Mexicali
Coolidge
Tucson
Lordsburg
Deming
Carlsbad Caverns National Park
Benson
El Paso
FORT WORTH
Cleburne
Ciudad Juarez
McGregor
Temple
Taylor
National Railways of Mexico to Chihuahua and Mexico City
Alpine
Austin
Sanderson
San Marcos
Big Bend National Park
Del Rio
SAN ANTONIO
Willits
• Ukiah
• Cloverdale
• Healdsburg
• Santa Rosa
• Rohnert Park
• Petaluma
• Napa
• Vallejo-Marine World
Martinez
Los Angeles
• Glendale
• Burbank Airport
• Van Nuys
• Chatsworth
• Simi Valley
• Thousand Oaks
• Oxnard
• Ventura
Santa Barbara
Legend
Amtrak Train Routes
Connecting Rail Service
Amtrak Thruway Bus Service
Connecting Ferry Service
Connecting Motor Coach Services
Seasonal Train Service

Rail Passenger System

An endangered species: Railroad control towers are rapidly being replaced by remotely controlled switches and signals. Ridgeway Tower, which once controlled a railroad interchange and several miles of track in Central Ohio, was closed in 1989.

Steam-powered trains always attract large crowds. When one is in your area, listen to local law enforcement and fire departments.

Plumes of smoke such as this from C&O 614 sometimes result in many fire calls to fire departments along the train's route. Sidney, Ohio, had a fire engine on the scene to water 614 in April of 1981, so it wasn't fooled by the phone calls.



Amtrak's Lake Shore Limited approaches a drawbridge on the Portage River in Port Clinton, Ohio.

filling the tender with the thousands of gallons of water they require every few hundred miles. Trip sponsors, therefore, usually contact fire departments along the route to fill the tender from a hydrant.

Perhaps the rail line you're monitoring crosses a river on a drawbridge or swing bridge. If so, you'll be able to hear water craft calling the bridge on VHF Marine Calling Channel 16 at 156.800 MHz. You'll also hear rail traffic on other marine channels around a barge loading or unloading facility. Finally, for general information on events to attract die-hard fans, there are five amateur radio frequencies commonly used by "rail-hams": 146.490, 146.565, 223.620, 446.050, and 1294.425 MHz.

I hope you enjoyed our ride and this basic overview of the communications to be heard on and around railroads. If you'd like to learn more and get more detailed frequency information, check out the sources mentioned at the end of this article...then, it's *All Aboard*!

Association of American Railroads Allocated Frequency Guide

Channel	Freq.	Channel	Freq.	Channel	Freq.
02	159.810*	34	160.620	66	161.100
03	159.930*	35	160.635	67	161.115
04	160.050*	36	160.650	68	161.130
05	160.185*	37	160.665	69	161.145
06	160.200*	39	160.680	70	161.160
07	160.215	39	160.695	71	161.175
08	160.230	40	160.710	72	161.190
09	160.245	41	160.725	73	161.205
10	160.260	42	160.740	74	161.220
11	160.275	43	160.755	75	161.235
12	160.290	44	160.770	76	161.250
13	160.305	45	160.785	77	161.265
14	160.320	46	160.800	78	161.280
15	160.335	47	160.815	79	161.295
16	160.350	48	160.830	80	161.310
17	160.365	49	160.845	81	161.325
18	160.380	50	160.860	82	161.340
19	160.395	51	160.875	83	161.355
20	160.410	52	160.890	84	161.370
21	160.425	53	160.905	85	161.385
22	160.440	54	160.920	86	161.400
23	160.455	55	160.935	87	161.415
24	160.470	56	160.950	88	161.430
25	160.485	57	160.965	89	161.445
26	160.500	58	160.980	90	161.460
27	160.515	59	160.995	91	161.475
28	160.530	60	161.010	92	161.490
29	160.545	61	161.025	93	161.505
30	160.560	62	161.040	94	161.520
31	160.575	63	161.055	95	161.535
32	160.590	64	161.070	96	161.550
33	160.605	65	161.085	97	161.565

** Used in Canada only for railroads, used for trucking companies in the United States.*

End of Train Monitors

Primary	457.9375
Future use	457.5375
Norfolk Southern	161.115

UHF

452.8250/457.8250	452.9000/457.9000
452.8375/457.8375 LP	452.9125/457.9125 LP
452.8500/457.8500	452.9250/457.9250
452.8625/457.8625 LP	452.9375 LP
452.8750/457.8750	452.9500/457.9500
452.8875/457.887 LP	452.9625/457.9625 LP

LP: Low power
All frequencies in MHz.

Want to Find Out More...?

The limited space of this magazine article prevents us from listing specific frequencies for specific railroads, but you can consult these sources for more information.

Frequency Directories

The Compendium of American Railroad Radio Frequencies by Gary Sturm and Mark Landgraf, Kalmbach Publishing Co. It's 197 pages of railroad information and is available at most hobby shops or direct from publisher. Contact, 21027 Crossroads Circle, P.O. Box 986, Waukesha, WI 53187-0986, $16.95 + $3.00 s/h.

Police Call by Richard Barnett, published by Gene Hughes. Nine volumes covering continental U.S. with one to three pages per volume of railroad information. Available at Radio Shack, $9.95.

Monitor America by Richard Barnett, Scanner Master Publications. Includes several pages of basic railroad information and is available from some dealers or direct from the publisher. Contact, P.O. Box 428, Newton Highlands, MA 02161, (800)722-6701.for $24.95 +$4.00 shipping. *Scanner Master also offers some local area directories which may or may not contain railroad information. Ask for a catalog.*

Magazines

Extra 2200 South, Iron Horse Publishers. Features a regular railroad scanner column. Available at some local hobby shops or direct from publisher. Contact, P.O. Box 8110-820, Blaine, WA 98231. $13.75 per year.

Railfan & Railroad, Carstens Publications. Radio frequencies occasionally included with feature articles. Available at some local hobby shops, newsstands, or direct from publisher. Contact, P.O. Box 700, Newton, NJ 07860, $25.00 per year.

Trains, Kalmbach Publishing Co. Radio frequencies occasionally included with feature articles. Available at some local hobby shops, newsstands, or direct from publisher. Contact, P.O. Box 1612, Waukesha, WI 53187, $29.95 per year.

Scanner Clubs

All Ohio Scanner Club, 50 Villa Rd., Springfield, Ohio 45503. Covers Illinois, Indiana, Kentucky, Michigan, Ohio, Pennsylvania and West Virginia. Membership $18.00 per year, includes newsletter with a regular railroad scanner column. SASE for information.

Bay Area Scanner Enthusiasts, 4718 Meridian Ave. #265, San Jose, CA 95118. California coverage. Membership $15.00 per year, occasional railroad scanner information. SASE for additional information.

North East Scanner News, P.O. Box 62, Gibbstown, NJ 08027. East Coast coverage from Virginia through New England. Membership $29.00 per year includes newsletter with occasional railroad scanner information. SASE for information.

Radio Communications Monitoring Association, P. O. Box 542, Silverado, CA 92676. Nationwide coverage. Membership $24.00 per year includes newsletter with regular railroad scanner column. SASE for information.

RNZI staff members at the transmitter site.

Radio New Zealand International—A View From The Pacific

Welcome to a shortwave station with a special flavor that you can tune tonight.

By Gerry L. Dexter

It was heralded as "a new voice for the South Pacific" and for once it wasn't media hype and ballyhoo. When it went on the air wearing its new clothes back in October, 1990, Radio New Zealand International (RNZI) lived up to its slogan. It still does.

Many experienced SWLs (shortwave listeners) count RNZI as one of their favorite stations and have considered it so for as long as they've been listening to shortwave—even 30 or 40 years! Back then, RNZI's friendly voices and captivating programs were well-heard in America, despite the 7.5-kW transmitters the station was using.

But as the years went on, more and more international broadcasters added higher power transmitters. First 100-kW, then 250-kW, and finally half a million-watt transmitters were pumping signals on frequencies all over the international shortwave bands. RNZI, however, was forced by budget constraints to stick with their low power units. These, incidentally, originally belonged to the U.S. Army which turned them over to New Zealand after World War II! They were used by RNZI from 1947 until just recently!

The Ravages of Time

Time eventually began to take its toll on the equipment, and the units became harder and harder to keep in operation. The RNZI signal suffered from increasing interference as the shortwave spectrum grew more crowded.

There were two or three occasions during the later years when the New Zealand government considered tossing in the towel and closing the station down. Each time that threat reared its head, however, thousands of listeners wrote in from around the world to protest such a move. And each time, the government managed to find enough money to keep the station going. But, for years, about the only programs carried over RNZI were relays of the domestic radio network—which, in a way, made for even more interesting listening.

One of RNZI's QSL cards, confirming reception of the station. Always be sure to include a couple of IRCs with your reception report as a form of return postage.

In the late 1980s the question of RNZI's future came up again. This time, the government didn't give the station just another reprieve, instead it provided a whole new lease on life. The government decided to create what would essentially be a whole new shortwave service. The new broadcasting effort would focus on providing a radio connection to the peoples and islands of the South Pacific. The government put up the money to buy high-power transmitters and to support the cost of producing original programming for the shortwave effort.

A new 100-kW transmitter was installed at Rangataiki, near Taupo, on the North Island. Programming was to be fed in from the Wellington studios via a microwave link. Two antennas were set up: one to cover the Southwestern Pacific, North America, and Europe; the other to cover the Southeast Pacific, Australia, Japan, and China. Both antennas could be

The transmitter site at Rangataiki, North Island.

used simultaneously during the middle part of the day's operating schedule. The facility was designed so engineers at the studios in Wellington could change the transmitter frequency via a computer hook-up, which meant no engineer had to be on duty at the transmitter site.

Back to the Present

At 0400 UTC on January 24, 1990, the new RNZI came on the air. No flash. No jingles. No zinger, laser-like sound effects, and no screaming announcers. That's not its style. Instead, the first sound broadcast was a Maori native prayer which "passed the spirit of the old transmitter to the new."

The new RNZI serves listeners throughout the Pacific region. Indeed, many of its programs are now relayed by medium wave and FM stations through the islands of the Pacific. The station gives Pacific islanders who have relatives living and working in New Zealand a regular source of news and information, telling them about what's happening in New Zealand and on the various Pacific islands.

The first year or so of the new operation saw more than its share of problems, however. Everyone had rushed to get the new RNZI on the air in time for the opening of the British Commonwealth Games, which the station wanted to beam to the islands. The old adage that "haste makes waste" appeared true as technicians were confronted with numerous glitches and breakdowns—so many, in fact, that an engineer had to be sent out from the French manufacturer to correct the situation.

Besides that, almost no one on the programming staff knew anything about shortwave. Those who did have broadcast experience had acquired it at the local level. And there are subtle, but significant, differences between producing and airing broadcasts for a local audience and broadcasting to an international one. The shortwave program staff got their training right on the job.

But mixed in with the problems came good news in the form of the avalanche of mail that poured into the station. Letters came from all over Asia, as well as the U.S. and Canada, England, Germany, and Scandinavia. Over 90 countries were heard from in the first few months RNZI was on the air!

Today, RNZI's appreciative audience is well-established in the U.S. and elsewhere. It's made up of people who have an affinity, or even just curiosity, towards New Zealand and the Pacific islands and want to know what's going on there.

The Mission

The station's mission is to be "a friendly, trusted voice talking with listeners in neighboring South Pacific countries and elsewhere about life in our country and region, the things we can offer, and the parts we can play in the Pacific and world affairs." The station is also charged with ensuring honest and impartial treatment of its programs for its listeners and contributors, advancing overseas appreciation of the "mana" of New Zealand, and sharing with the world the value the country places on democracy, equality, and freedom. And, all the while, RNZI airs the words, songs, and music of New Zealand. ■

Tuning In

RNZI is on the air 18 hours a day, broadcasting primarily in English. There are also broadcasts, especially news reports, in Pacific languages like Maori, Samoan, Nieuan, Tongan, Fijian, Bislama, and others. French programs can also be found on the station. The segments are repeated at various times as the day dawns across the Pacific.

New Zealand domestic broadcasting is still relayed by RNZI, airing for about six hours each day. RNZI realizes that this programming has a real appeal to New Zealand expatriates who are living and working in other countries.

The rest of the schedule is filled with many special programs. A sampling includes Pacific Regional News, Coastal Weather Forecasts, Asia-Pacific Business Report, Orient Express, Today's New Zealand Newspapers, Calling Niue, Pacific Beat, Calling Pitcairn and Norfolk, Oceana, Calling Vanuatu, Travel Pacific, Pacific Island News Magazine, and a long list of others. There's live sports coverage, too. "What's On," a brief feature aired three times each day, previews upcoming programs. Listen for this at 1755, 2015, and 1050 UTC.

RNZI is currently scheduled from 1658 to 1849 UTC on 6100, from 1850 to 2139 on 11735, 2137 to 0458 on 15115, 0459 to 0758 on 11900, and 0759 to 1206 on 6100 kHz. Reception in North America will be best on frequencies in use during our evening through night hours.

You don't have to spend much time listening to RNZI before you start noticing the special flavor of this station. It manages, somehow, to sound modern, yet still retains an air of excitement and romance found too infrequently in shortwave programs today.

Try it tonight. If you haven't heard Radio New Zealand before, we'll bet that once you've listened a while, you'll come back for more!

Get in Touch

You can get a copy of the current RNZI schedule by writing to Radio New Zealand International, P.O. Box 2092, Wellington, New Zealand. Letters reporting reception of the station may be sent to the same address. You should include three international reply coupons (IRCs), available from your local post office, as a form of return postage, especially when requesting schedules or QSL cards. Because of staff and budget constraints, the station does not encourage sending cassette recordings of reception. Radio New Zealand International has a marketing division through which you can purchase Radio New Zealand International t-shirts, cassette tapes of New Zealand music, and other items. To receive a catalog, send a request, accompanied by IRCs, to the address above.

In Review: The Digital Signal Processor 21-543

By Allen Lorentson, N3DCX

Have you ever come oh-so-close to finally chasing down that rare and exotic shortwave station, only to lose it in the heterodynes and hash? Or maybe you've gone on a long trip with the family and wanted to keep your citizen's band radio on for road reports, only to have all the whines and noises drive you to turn it off or face a divorce? Or maybe it's your scanner or ham rig that just doesn't have the audio punch that you need. Then maybe the new Radio Shack Digital Signal Processor (DSP) with amplified speaker will help you. It just hooks up to your external speaker or earphone jack and treats you to some of the latest technology in audio processing.

This compact unit measures 1 15/16" X 4 9/16" X 7 1/16", has a top-mounted speaker, raised plastic feet for home use, and comes with a clip-on bracket that removes quickly for mobile use. On the front panel are the controls for bandwidth, filters, volume, and DSP on/off (with indicator) and a 1/4" headphone jack. On the back panel are connections for 12 Vdc power audio input and external speaker.

In Operation

The controls are straight forward and easy to use. The table in the manual shows how the bandwidth and filter controls work in conjunction. Just remember, you're adjusting them to make the audio sound best to you, so there really isn't a right or wrong. Next to these controls is the volume control for the amplified speaker with built-in main power switch. Last, to the far right, is the DSP control with flashing indicator. You simply adjust the volume on your radio until this indicator flashes with the peaks in the audio and the DSP unit is set properly.

Now, the big question: How well does the unit work? The answer is very well. The DSP is a flexible unit and can meet many needs in one package, making use of different features for different bands and listening situations.

For instance, overall noise reduction in the NR mode is typically 20 dB and the heterodyne rejection in NR or SSB modes can go to 40 dB. Since this unit includes both NR and DSP circuits, it works under varied conditions. Typically, the NR and DSP complement each other: the NR reduces received noises, while the DSP removes heterodynes. But, when set to the shortwave and CB bands, the DSP circuit really shines! I was able to pull weak signals out of the whines and hash and make them readable. Tuning between stations, there was no noise, just a little bit of static. The DSP doesn't do much for pulse-type interference, but that's a job for noise blankers. On my scanner (a PRO-2006), the DSP removed some high frequency hiss and improved some of the poorer signals. It also dropped the level of annoying pager alert tones, making monitoring a little easier on the ears. The only place the DSP mode had a negative effect was with my HTX-202 2-meter handheld. In this case, the DSP mode didn't improve most signals simply because the DSP circuit is designed to remove AM heterodynes. The DSP's features—basic noise reduction and audio amplification—were still very handy with the HTX-202, especially the amplifier which can overcome road noise in your car.

The Radio Shack Digital Signal Processor, 21-543.

Overall

The DSP is a great heterodyne and whine killer. It will make your CB and shortwave radio listening much more enjoyable. It will probably also make many long family trips more enjoyable when the only sounds coming from the CB are those you want to hear. The filters and amplifier will make life a lot easier with other equipment also. At only $79.99, it is priced well below any competition and is available now at your local Radio Shack store. ■

The DSP's Specifications

Frequency Response
- DSP Out Mode - 300 to 3000 Hz
- NR Mode - wide bandwidth 200 to 2950 Hz
  - med bandwidth 200 to 2500 Hz
  - narrow bandwidth 200 to 2000 Hz
- CW Mode - wide bandwidth 269 to 1231 Hz
  - med bandwidth 469 to 1031 Hz
  - narrow bandwidth 597 to 903 Hz
- SSB Mode - wide bandwidth 300 to 3000 Hz
  - med bandwidth 500 to 2600 Hz
  - narrow bandwidth 800 to 2000 Hz

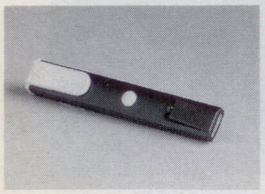
Total harmonic distortion - 1.0% typical
Signal-to-noise ratio 55 dB typical
Audio input level 3.0 volt peak-peak, max.
DC 12 V input 11 to 15 Vdc, 1.0 A, max.
External speaker output - 8 ohms, 8 watts
Audio output power (to ext. speaker) - 6.0 watts typical
Heterodyne rejection (SSB/NR mode) - 40 dB, max.
Noise reduction (NR mode) - 20 dB, typical
Weight - 1 lb. 4 oz.

THE PARTS PLACE SM

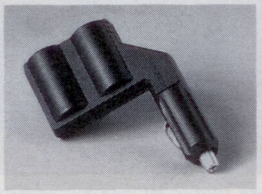
Multimeter/counter with PC interface

Dual-display LCD digital meter measures AC/DC voltage, capacitance and transistor gain, frequencies to 20 MHz. Includes MS-DOS/Windows® compatible software on 3½" disk. #22-168 ..... **129.99**

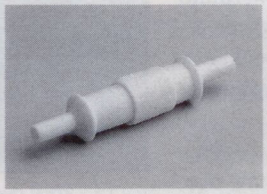
Big values in tools, test equipment, parts and accessories



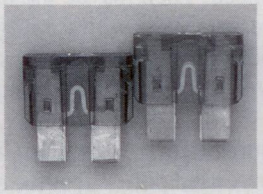
AC Voltage Sensor. No direct hookup required—safe way to check cords, switches, fuses, more. Indicates 70 to 440VAC. #22-103 ..... **12.99**



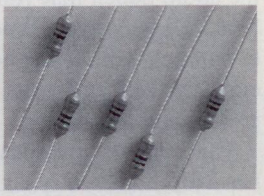
Modular 2-Outlet 12VDC Adapter. Power two 12VDC-operated devices with lighter-style plugs from one vehicle lighter outlet. #270-1525 ... **6.99**



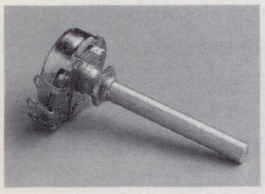
Inline Fuse Holder for Glass Fuse. For fuse rated up to 20 amps. Dozens more items for mobile radio installations available! #270-1211 .. **1.19**



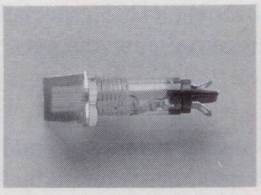
Blade-Type Automotive Fuse Kit. Includes one each of the most popular sizes: 5, 7.5, 10, 15 and 20 amps. #270-1201 .. **Set of 5/1.99**



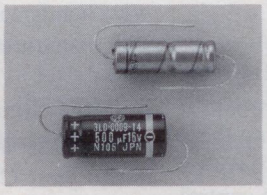
¼-Watt Metal-Film Resistor Assortment. Collection includes 50 pieces of 12 values from 10 ohms to 1 megohm. 1% tolerance. #271-309 ..... **2.29**



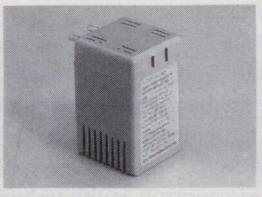
100k-Ohm Linear-Taper Potentiometer. For your projects and repairs. Has 6mm-diameter shaft suitable for ¼" applications. 271-092 ..... **1.29**



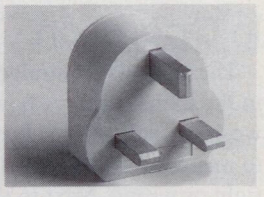
12-Volt Red Neon Lamp Assembly. Long-lasting, super-bright—excellent for use as a pilot light. Fits 7/16" mounting hole. #272-704.. **Pkg. of 2/1.99**



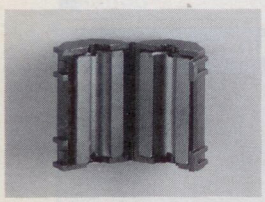
Electrolytic Capacitor Assortment. Includes mini and submini sizes in a variety of styles, rated up to 50WVDC. #272-802, **Set of 20/2.29**



240V-to-120V Foreign Travel AC Converter. For electronic/motorized devices rated to 50W, heating devices rated to 1600W. #273-1410 ..... **34.99**

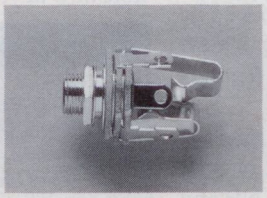


Foreign AC Converter Plug Adapters. Use with most outlets, including recessed. Must be used with a converter. #273-1405, **Set of 4/7.99**

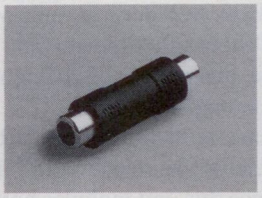


Snap-Together Ferrite Core. Cuts radio frequency transmission/pickup. Snaps over computer and AC cables, audio leads, coax. #273-105..... **5.49**

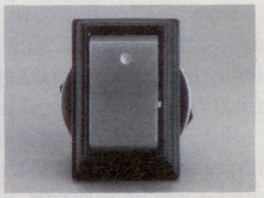
¼" Stereo to ¼" Mono Plug Adapter. Connect lightweight stereo phones with ⅛" plug to monaural audio equipment having ¼" jack. #274-348 .. **2.49**



¼" Open-Frame Stereo Jack. Three-conductor open-circuit jack for project building and audio equipment repairs. #274-312, **Pkg. of 2/2.79**

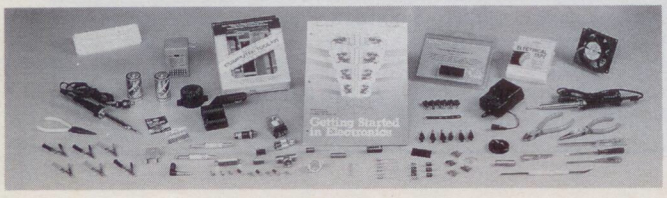


Gold-Plated Phono Plug Coupler. Ideal for linking A/V patch cords. Gold ensures secure hookup and superior signal transfer. #274-874 ..... **1.99**



Heavy-Duty SPST Rocker Switch. Rated 6 amps at 125VAC. Mounts in ¾" hole. In stock today—see before you buy at The Shack! #275-690 .... **1.99**

Enjoy speedy service and low prices on thousands of items



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- ***CB and scanner crystals*** ■ ***Long-life vacuum tubes***
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Digital logic probe with "beep" tones

Spots problems in PCs and digital circuits. Color-coded LEDs indicate high, low and pulsed logic states, while tones free your eyes for faster testing. Trouble-shooting manual. #22-303 . . . **17.99**

Power your mobile radio from home AC

This 120VAC-to-12VDC regulated power supply is ideal for operating mobile CBs, Ham rigs and car stereos from AC. Great for trouble-shooting, too. Heat sink. 2.5 amps continuous. #22-120 . . . **39.99**

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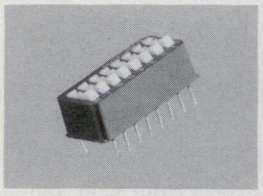
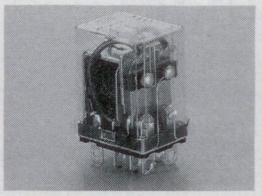
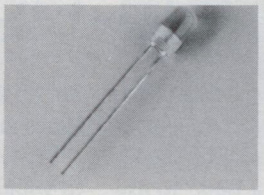


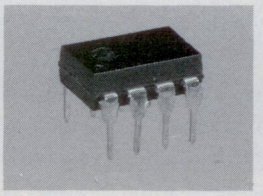
8-Position DIP Switch. For digital and low-current uses. Plugs into standard 16-pin integrated circuit socket. #275-1301 . . . . . **1.79**



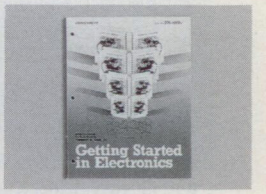
4PDT Relay. Contacts: 3A at 125VAC. Coil: 12VDC, 130mA, 150 ohms. With specs, internal schematic, pin-out diagram. #275-214 . . **5.99**



Bargain LED Assortment. For bright ideas. May include MV-series, red, green, amber and IR emitters. #276-1622, **Set of 20/2.29**

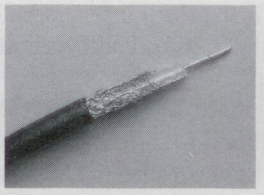


LM3909 8-Pin DIP LED Flasher. Flashes LED with a minimum of support parts. Operates on single-cell (1.5VDC) power. #276-1705 . . . **1.69**

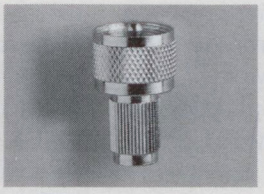


Getting Started in Electronics. Perfect hands-on introduction to a fascinating subject by Forrest Mims III. 128 pages, illustrated. #276-5003 . . **2.99**

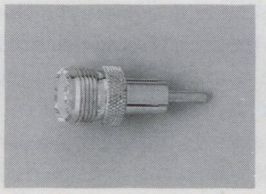
Mini Audio Amp With Built-In Speaker. Many uses—test amp, signal tracer, phone amp and amplified PC speaker. #277-1008 . . . . . **11.99**



RG-58 Shielded Coaxial Cable. Preferred for Ham, CB, scanner hook-ups. Low-loss design, all-copper conductors. #278-1314 . . . . . **Foot/22¢**

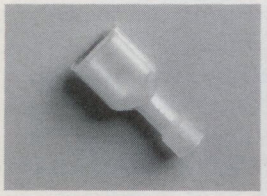


No-Crimp Solderless PL-259 Plug. Popular connector for use on RG-58 cable. Installs with a flat-blade screwdriver. #278-186. . . . **3.29**

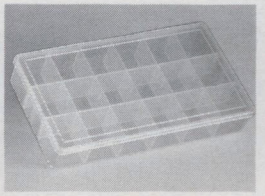


"Scanner" Adapter. Connects coaxial cable having a PL-259 plug to the Motorola-type jack found on many scanners. #278-208 . . . . . **1.99**

14-Piece PC Tool Kit. Slot and Phillips drivers, chip extractor and inserter, nutdriver, tweezers, parts tube and carry case. #64-1972 . . . . . **14.99**



Insulated Female Quick Disconnects. Conveniently color-coded red for 22-18 AWG wire. Two each of .250", .187" and .110". #64-3058 . . **Pkg. of 6/1.39**



Parts Storage Box. Handy $8\frac{1}{2} \times 4\frac{3}{4} \times 1\frac{1}{2}$" clear plastic box features six compartments, with dividers to create 18. #64-552 . . . . . **3.19**

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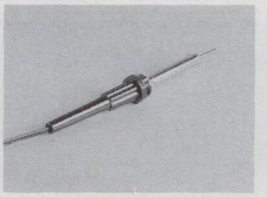

30-Watt Mobile Soldering Pencil. Ideal for car accessory and stereo wiring jobs. Plugs into lighter socket, uses 12VDC. #64-2105 . . . . . **5.99**

.062" Rosin-Core Solder. For reliable connections in hobby and repair projects. Standard 60/40 formula. 4.0 oz. #64-004. . . . . **3.79**

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Since 1921 Radio Shack has been the place to obtain quality electronic parts, tools, test equipment and accessories. Today we continue our tradition of supplying high-tech products at competitive prices. And we're not *just* for hobbyists! Quantity buyers and purchasing agents: Call or visit your neighborhood Radio Shack store and check out our quantity discount schedule. Save big on wire and cable, test equipment, tools, solder, hardware, chemicals and more. You'll be glad you did!

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Best Bet Shortwave Broadcasts In English

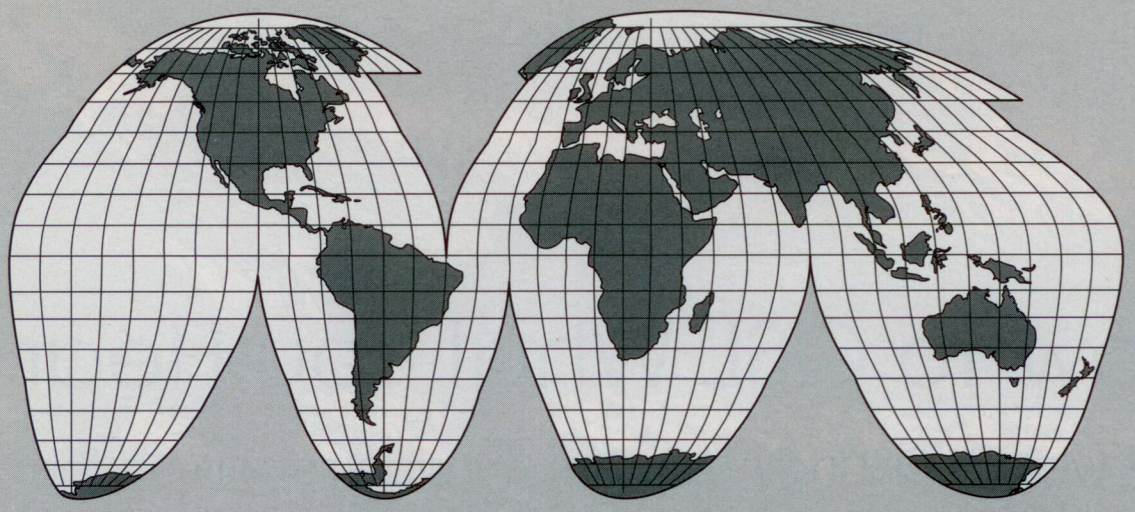
For most people, listening to foreign broadcasts is the biggest lure of shortwave listening. To get you started on the international shortwave listening scene, we've provided a listing of some of your "Best Bets" to use as a starting point. These are stations that you're likely to be able to pick up and that broadcast at least some of the time in English.

How well you receive the stations on this list will vary with atmospheric conditions, seasonal changes, your listening location, and your receiving equipment. Stations may also make changes in the times and frequencies of broadcasts with little or no advance warning. Some will move their transmissions up or back an hour with the arrival or departure of their local daylight savings time. Not all of the frequencies listed for a particular broadcast will provide equally good reception; some frequencies may not even be in use. Stations may also have other frequencies in use at the times listed here, and many may be on the air at other times and on other frequencies. Some broadcasts are on weekdays only, or are not on the air daily. Stations will often announce their other times and frequencies.

We've provided a general grading to give you some idea of what kind of reception you may expect from each station. The grading is based on the use of an average portable shortwave receiver under normal propagation conditions. One star indicates generally poor reception, two is average, three indicates generally good reception. Listeners in the western part of the USA will get generally better reception from Asia and the Pacific than will listeners in the east. Conversely, those in the east will enjoy better reception from stations in Europe and Africa.

Times indicated are in UTC (Coordinated Universal Time). This 24-hour universal time system is five hours ahead of Eastern Standard Time, so 0000 UTC equals 7 p.m. EST, 6 p.m. CST, 5 p.m. MST and 4 p.m. PST, etc. All broadcasts listed here are in English and, on the average, represent the time and frequency combinations which should provide best reception.

Station	Time	Frequencies	Grade
R. Tirana, Albania	0130	9580, 11840	**
RAE, Argentina	0200	11710	**
R. Australia	morning	9580, 11660, 11800	**
R. Austria	0530	6015	***
R. Vlaanderen, Belgium	2330	11740, 13655	*
Radiobras, Brazil	1200	15445	*
R. Bulgaria	0330	9700, 11720	**
R. Canada	0100	9755, 11845, 11949	***
CFRB/CFRX, Canada	24 hrs.	6070	**
China Radio	0000	9780, 11715	**
TWR, Costa Rica	0100	5030, 9725, 13750	**
Croatian Radio	0500	7315, 9495	***
R. Havana, Cuba	00-07	6010, 9510	***
R. Prague, Czech Rep.	0100	7345, 9485	**
HCJB, Ecuador	0030	9745, 11925, 17490	***
R. Cairo, Egypt	0200	9475	*
BBC, England	24 hrs.	5975, 7325, 9410, 15220, 15260	**
R. Finland	1230	11900, 15400	**
R. France	12,14,16	11670, 15180,17575	**
Deutsche Welle, Germany	01,03,05	6120, 9640, 11715	***



Station	Time	Frequencies	Grade
V. of Greece	0130,0340	9380, 9420, 11645	*
R. Cultural, Guatemala	0300	3300	*
NBC, Papua New Guinea	1100	4890	**
R. Budapest, Hungary	0300	9835, 11910	*
All India Radio	2100	11620	*
VOIRI, Iran	0030	9022, 11790	*
Kol Israel	0400	17545	**
RAI, Italy	0050	9725, 11800	**
R. Japan	0300,1100	6120, 15210, 17810	***
R. Jordan	1200	9560	*
R. Korea, S. Korea	1030	11715	*
R. Kuwait	1800	11990	**
ELWA, Liberia	0600	4760	*
V of Mediterranean, Malta	0600	9765	*
R. Netherlands	0030	6020, 6165, 9840	***
R. New Zealand	0600	11900	**
V. of Nigeria	0500	7255	*
R. Pyongyang, N. Korea	1100	9977, 11335	*
R. Norway	1200(Sun)	17860	**
Polish Radio Warsaw	1200	9525, 11815	*
R. Portugal	0230	9570, 9705, 11840	**
R. Romania	0200	6155, 9510	*
R. Moscow	1207	9530, 9765, 11750, 11805, 15455, 17675	**
R. Singapore	1100	9530	*
Slovak R., Slovakia	0100	5930, 7310, 9810	*
Channel Africa, S. Africa	0500	5955, 9695	*
Spanish National Radio	0000	9540	**
R. Sweden	0330	6040, 9850	**
Swiss Radio	0100	6135, 9885	**
R. Damascus, Syria	2005	12085, 15095	*
V. of Free China, Taiwan	0200	5960, 9680	***
V. of Turkey	2300	9445	**
R. Ukraine	0100	7285, 9860, 12030	**
V. of UAE	0330	11945, 13675, 15400	**
Voice of America	24 hrs.	5995, 9760, 13710, 15205, 15580	***
R. Tashkent, Uzbekistan	1200	15295, 17815	*
Vatican Radio	0250	6095, 7305	**
R. Nacional, Venezuela	0055	9540	**
R. Yugoslavia	0000	9580, 11870	**

How To QSL What You Hear

Just what is QSLing? Here's the inside scoop on this time-honored tradition with hints on filling your mailbox with QSL cards and letters from around the world.

By Gerry L. Dexter

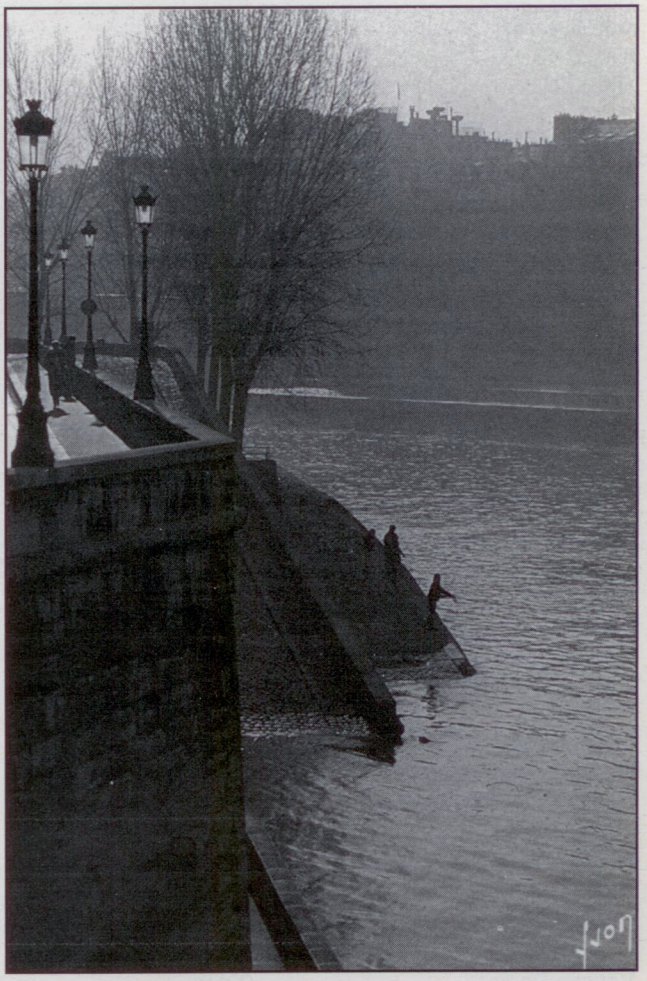
QSLing is a tradition that dates back to radio's earliest days. A QSL is a card or letter sent by a radio station to a listener, or by an amateur radio station to another ham, which confirms reception of the station (or a two-way contact in the case of the hams).

For many shortwave listeners, or SWLs, simply hearing a station is only half the process. They collect QSLs as proof of their reception and as a visual reminder of their logging, just as other people may collect stamps, matchbook covers, or commemorative plates. With time and effort you can build a collection of replies from all over the world that includes interesting letters, colorful postage stamps, attractive QSL (verification) cards, even pennants.

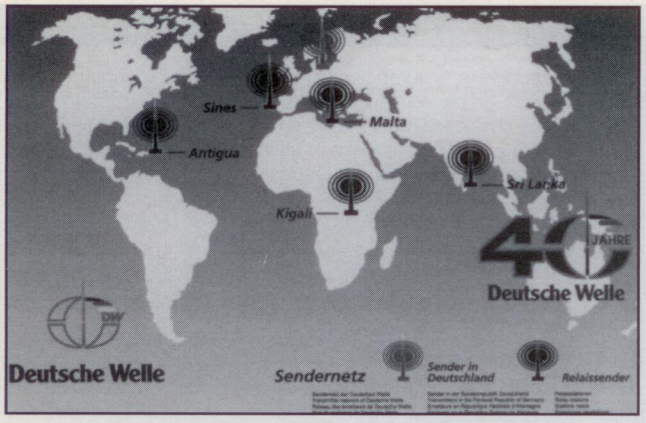
How Do You Get a QSL?

First, you have to write to the station you've listened to and tell them about your reception. This communication should include the date and the time of listening, given in Coordinated Universal Time (UTC), the internationally agreed upon "World Time." For smaller stations you pick up, you may also want to mention the local time at the station. You'll also have to tell them the frequency on which you heard the transmission.

The station will want to know how well you heard the broadcast, so give them an idea by indicating how clearly and strongly you received their signal. Was the signal disrupted by interference from another station (known as QRM)? If so, how bad was it? Was there signal fading (QSB)? How about static (QRN)? You can supply the station with this information using what's known as the SINPO reporting code. The SINPO system indicates the signal strength, various forms of interference, and an overall qual-



Many stations have scenic cards, such as this view of Paris and the river Seine from Radio France International.



One of the QSLs from the Deutsche Welle—The Voice of Germany indicates the sites of all of its relay transmitters.

One of the many Voice of Turkey QSLs.

ity rating in numbers ranging from 1 to 5. A perfect reception would be SINPO: 55555, and the worst possible reception would be indicated as SINPO: 11111. Nearly all actual radio reception is somewhere in between.

You will also have to supply some proof that you actually heard the station. This is done by describing some of what you heard. You need to be as specific as possible here. Instead of saying you heard a newscast, mention the items on the newscast. Give details as to the subjects of feature reports, interviews, and other programs. Quote all or part of station identification announcements and sign on/off announcements. Mention music titles whenever possible, or at least describe the type of music being played. The bottom line here is to provide as much detail as you can. The more you give them, the easier it is for the station to be sure it was their broadcast you heard. Also, try to make some comment about the programs you heard. Stations really appreciate getting feedback from listeners about the programs they're broadcasting.

You can also tell them what receiver/antenna combination you used. You might want to say something about yourself—your job, family, other interests, etc. It's also a good idea to include an extra incentive, such as a picture postcard of your area, a radio station bumper sticker, or other lightweight item that might be of interest to the station.

Finally, mention that, if your report is correct, you would like to have a card or letter of verification (QSL). Never *demand* a reply—no station owes you a QSL! In fact, be friendly and polite throughout your letter.

Letter Formats

All of this information can be conveyed in a letter or in a reception report form designed for this purpose. Some SWLs use both methods, putting the technical details and program descriptions in a form, then adding a cover letter containing program information and other comments. If you own a computer, you'll find that writing reception reports in either format is very easy. You can create a fairly standard letter which you can copy and edit for each new station you want to contact. Make sure you keep an extra copy of your request for your files.

Sending and Tracking Reports

Most stations appreciate it if you supply return postage. For foreign countries, this can be in the form of an International Reply Coupon (IRC) or mint stamps of the country concerned. (IRCs can be obtained from your local post office. Mint stamps can be obtained from William Plum, 12 Glenn Road, Flemington, NJ 08822.)

Addresses for shortwave broadcasting stations can be found in the two primary annual reference guides to shortwave broadcasting. They are the *World Radio TV Handbook* (published by Glenn Hefferman, Billboard Books) and *Passport to World Band Radio* (published by International Broadcasting Services, Ltd.) Any bookstore can order them for you.

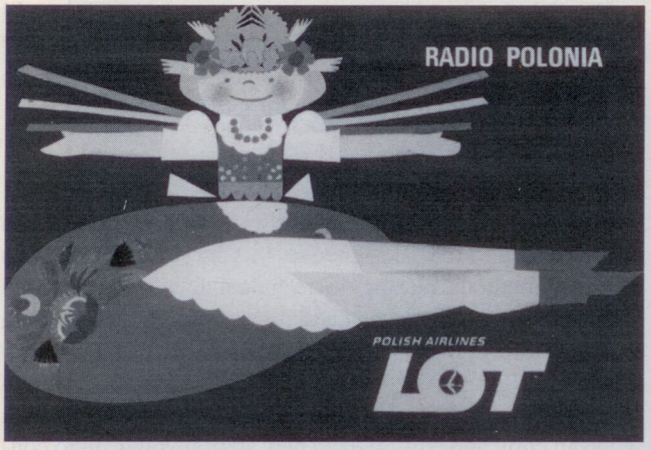
Always send your report via airmail. It doesn't cost that much more, especially when you consider the time it saves and the vastly improved chances that your letter will reach its destination.

Keep some sort of log of the reports you've sent out, either by date or by station. The latter probably works best because it's quicker to check on how long a report to a particular station has been out, when your last follow-up was sent, etc.

Foreign Languages

There may be times when you want to send a report on a broadcast you heard in a language you don't speak, say, Portuguese. How are you to get program details? This is one of the hidden benefits of SWLing—it teaches you how to listen. Listen carefully enough and you'll be surprised at how much you can understand about the program you've tuned. You'll soon find you can pick out people and place names. You'll learn to recognize the kind of program being broadcast, whether a sports show, religious service, telephone talk show, or a political speech, by the way it sounds, even though you don't know the language.

You'll get a much better response rate if you send reports to stations in Latin America, Indonesia, and the countries of what was formerly French Africa in their native languages.



This interesting QSL from Radio Polonia (Poland) appears to have been funded by Polish Airlines.

That means finding a friend who speaks the required language and who is willing to translate a basic letter for you. There are also a few computer programs available that can translate English to another language. For instance, Tiare Publications of Lake Geneva, Wisconsin, sells a series of Language Lab books that takes you step-by-step through reports in Spanish, Portuguese, French, or Indonesian.

Utility Stations

There's one important difference when you report to the so-called utility stations (non-broadcast, non-amateur). Reports to stations such as military, aero, marine, and others obviously can't contain "program" details. For that matter, you are not *supposed* to quote the specifics of any two-way communications you hear on these stations. Just give the date, time, frequency, signal, and interference details, along with the station name, as proof of reception. You'll also find prepared cards especially helpful when reporting to utility stations, though some listeners hold off sending one until there's a need for a follow-up report.

Now a Little Bad News...

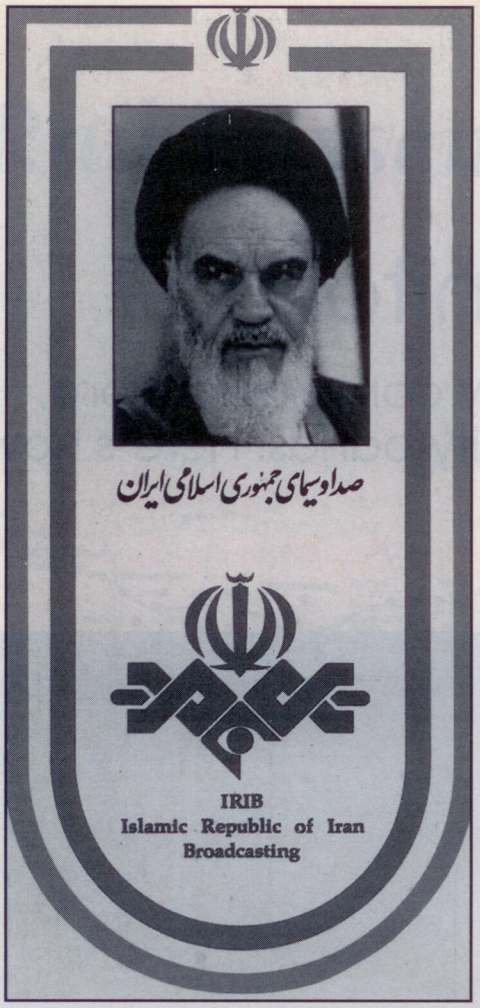
Radio stations don't have to reply to reception reports, and many, in fact, do not—at least not the first time. Now comes the challenging part of QSLing. If three or four months have gone by and you haven't had a reply to your report, send a follow-up. You should have already made a copy of your original reception report to use for just this purpose. Add a brief note to this copy saying that you haven't had a reply to your first letter and you'd be very appreciative if the station would respond. Don't forget to include return postage.

Your first follow-up letters may bring in a reply, but be prepared to continue this follow-up process. Some stations may continue to ignore your letters even after you've written several times! Eventually, it may become a test of wills—their disinterest or inefficiency versus your determination and creativity in seeking new ways to draw out a reply. Some SWLs take an almost perverse delight in situations like this; they enjoy the chase, trying to figure out an approach that

Q Signals

Given below are a number of Q signals whose meanings most often need to be expressed with brevity and clarity in radio communications. They are most often heard in amateur operations, but some are also used in reference to utility or shortwave listening. (Q abbreviations take the form of questions only when each is sent followed by a question mark.)

QRG	Will you tell me my exact frequency (or that of ____)? Your exact frequency (or that of ____) is ____ kHz.
QRH	Does my frequency vary? Your frequency varies.
QRI	How is the tone of my transmission? The tone of your transmission is ____ (1. Good; 2. Variable; 3. Bad).
QRJ	Are you receiving me badly? I cannot receive you. Your signals are too weak.
QRK	What is the intelligibility of my signals (or those of ____)? the intelligibility of your signals (or those of ____) is ____ (1. Bad; 2. Poor; 3. Fair; 4. Good; 5. Excellent).
QRL	Are you busy? I am busy (or I am busy with ____). Please do not interfere.
QRM	Is my transmission being interfered with? Your transmission is being interfered with ____ (1. Nil; 2. Slightly; 3. Moderately; 4. Severely; 5. Extremely.)
QRN	Are you troubled by static? I am trouble by static ____ (1–5 as under QRM).
QRO	Shall I increase power? Increase power.
QRP	Shall I decrease power? Decrease power.
QRQ	Shall I send faster? Send faster (____ WPM).
QRS	Shall I send more slowly? Send more slowly (____ WPM).
QRT	Shall I stop sending? Stop sending.
QRU	Have you anything for me? I have nothing for you.
QRV	Are you ready? I am ready.
QRW	Shall I inform ____ that you are calling on ____ kHz? Please inform ____ that I am calling on ____ kHz.
QRX	When will you call me again? I will call you again at ____ hours (on ____ kHz).
QRY	What is my turn? Your turn is numbered ____.
QRZ	Who is calling me? You are being called by ____ (on ____ kHz).
QSA	What is the strength of my signals (or those of ____)? The strength of your signals (or those of ____) is ____ (1. Scarcely perceptible; 2. Weak; 3. Fairly good; 4. Good; 5. Very good).
QSB	Are my signals fading? Your signals are fading.
QSD	Is my keying defective? Your keying is defective.
QSG	Shall I send ____ messages at a time? Send ____ messages at a time.
QSK	Can you hear me between your signals and if so can I break in on your transmission? I can hear you between my signals; break in on my transmission.
QSL	Can you acknowledge receipt? I am acknowledging receipt.
QSM	Shall I repeat the last message which I sent you, or some previous message? Repeat the last message which you sent me (or message[s] number[s] ____).
QSN	Did you hear me (or ____) on ____ kHz? I did hear you (or ____) on ____ kHz.
QSO	Can you communicate with ____ direct or by relay? I can communicate with ____ direct (or by relay through ____).
QSP	Will you relay to ____? I will relay to ____.
QST	General call preceding a message addressed to all amateurs and ARRL members. This is in effect "CQ ARRL."
QSU	Shall I send or reply on this frequency (or on ____ kHz)? Send a series of Vs on this frequency (or ____ kHz).
QSW	Will you send on this frequency (or on ____ kHz)? I am going to send on this frequency (or on ____ kHz).
QSX	Will you listen to ____ on ____ kHz? I am listening to ____ on ____ kHz.
QSY	Shall I change to transmission on another frequency? Change to transmission on another frequency (or on ____ kHz).
QSZ	Shall I send each word or group more than once? Send each word or group twice (or ____ times).
QTA	Shall I cancel message number ____? Cancel message number ____.
QTC	How many messages have you to send? I have ____ messages for you (or for ____).
QTH	What is your location? My location is ____.
QTR	What is the correct time? The time is ____.



For several years this fellow adorned the QSLs of Islamic Republic of Iran Broadcasting.

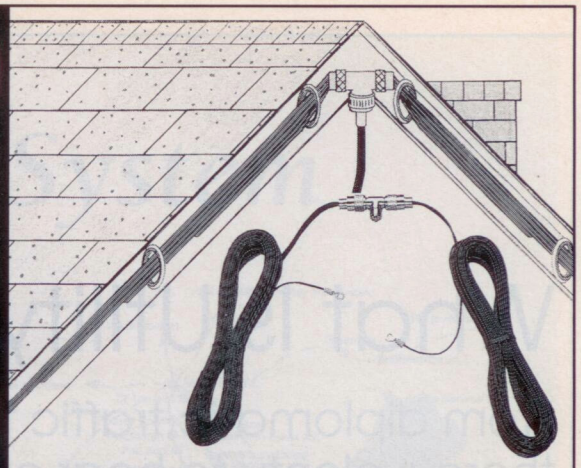
will bring a response. Eventually, the determined QSL collector will almost always succeed in the quest. You should easily get 20 to 30 percent of your reports answered on your first try. In most cases, your batting average will be higher simply because you'll probably be writing to the larger international broadcasters.

...But Persistence Pays Off!

Stations vary greatly in how easy or difficult they are to QSL. You'll find that some respond in just weeks, others take months, and, in rare cases, even years! But your persistence pays off! There are endless techniques and subtle methods you can use to elicit a QSL, such as writing to different departments within the station, sending registered reception reports, sending a "prepared card" (one you made yourself that the station need only sign and return to you), and so on.

QSL collecting is one of the most fascinating and challenging aspects of the shortwave hobby. With time, effort, creativity and determination, you, too, can build a collection of cards and letters from countries and stations in every corner of the world. Your collection will continue to grow in size and sentimental value as the years go by. ■

OUTDOORS



"Inverted V" shortwave antenna

World-band DXers—now hear what you've been missing! This multiple-dipole antenna is design-optimized for outstanding reception of all shortwave broadcast bands. No matching, no power source required—it's equivalent to over 190 feet of wire, yet just 65 feet in total length. Mounts easily on roof eaves or a single mast, and accepts a PL-259 plug so you can connect it to your receiver with low-loss coaxial cable. A terrific value—just $39.99 at your nearby Radio Shack.

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Amplified antenna packs a punch!

Shortwave fans—hear more stations, more clearly! This compact, 9V battery-powered antenna amplifies signals up to 20 dB for reception that rivals outdoor longwires. Its tunable preselector *peaks* your selected frequencies and *rejects* unwanted ones, dramatically improving reception of weak signals and giving already-strong stations crystal clarity! Plugs into radio's external antenna jack, tunes 4-30 MHz. With 29" telescoping whip. Just $29.99—great value!

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What Is Utility Monitoring?

From diplomatic traffic to military communications, there's plenty to hear on the utility bands. Here's how.

By Don Schimmel

In the roughly 200 kHz to 30 MHz portion of the frequency spectrum there are many different types of communications. No doubt you're aware of the domestic and international broadcast stations and amateur radio operations, but they comprise only about 25 percent of the frequency use. The other 75 percent is referred to as utility activity.

No, we aren't talking about listening to the electric company or the water department. Included within the scope of utility stations would be ship and shore stations of the maritime and aeronautical services, Navy, Army, Coast Guard, Air Force, diplomatic international press, and InterPol. In addition, there are communications of U.S. Government agencies, including the Drug Enforcement Administration (DEA), National Oceanographic and Atmospheric Administration (NOAA), Federal Emergency Management Agency (FEMA), and the Federal Aviation Administration (FAA) to name a few. There are also mystery stations to be heard! In this category you would find the so-called "spy numbers" stations, pirate and clandestine broadcasts, and even smuggler communications.

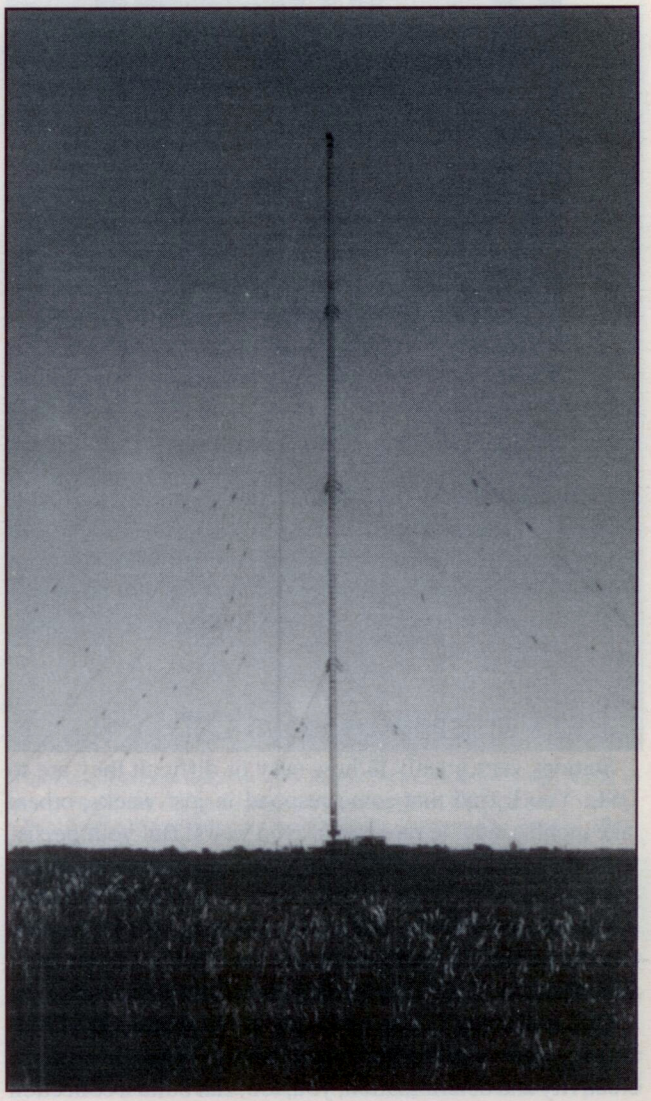
Below the Broadcast Band

At the low end of the frequency range, you will find many beacon transmissions which are used by units of the aeronautical and maritime services for navigational purposes.

During automobile trips, you've probably seen signs indicating a frequency to tune at the lower (530 kHz) or upper (1610 kHz) ends of the broadcast band. These are known as Traveler's Information Stations, often abbreviated as TIS. They alert drivers to detours, highway and traffic conditions, service stations and rest stop locations, and other pertinent details helpful to travelers.

On Shortwave

Some very useful features found in the shortwave bands are the frequency and time services of the National Institute



This USAF antenna is used for data transmissions in the Very Low Frequency (VLF) range. The antenna is located at Silver Lake, Nebraska. (Photo provided by Richard Baker, Ohio.)

of Standards and Technology (NIST) of the U.S. Department of Commerce. You can use the transmitted signals to set your clocks accurately and even obtain an indication of the quality of radio reception in the particular HF frequency range you're listening to.

Near the top end of the frequency range we've been discussing are Citizen's Band channels. There is a lot of activity in these channels which are located between 26960 and 27450 kHz.

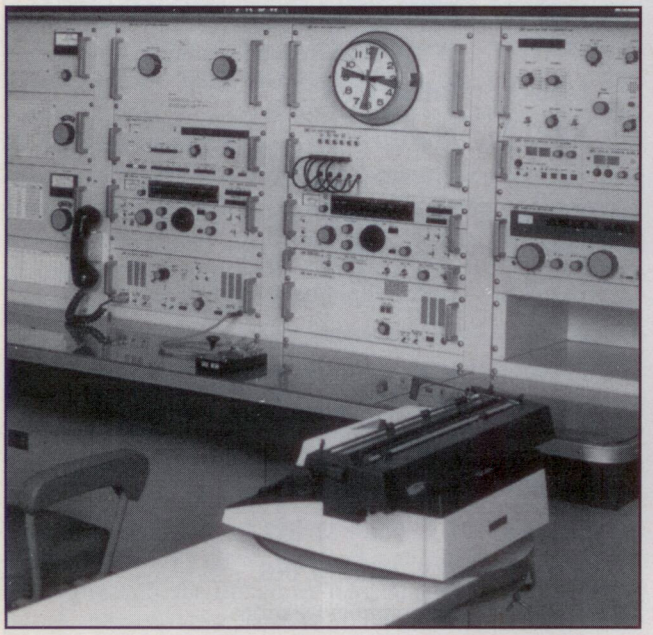
I've prepared a list of common utility communications frequencies which represents a sampling of utility communications. In it I've tried to include a wide variety of signals to give you a good idea of the many different stations found on the shortwave bands.

When you monitor aeronautical frequencies you can hear communications between ground stations and passenger planes like the one here. (Photo courtesy United Airlines.)

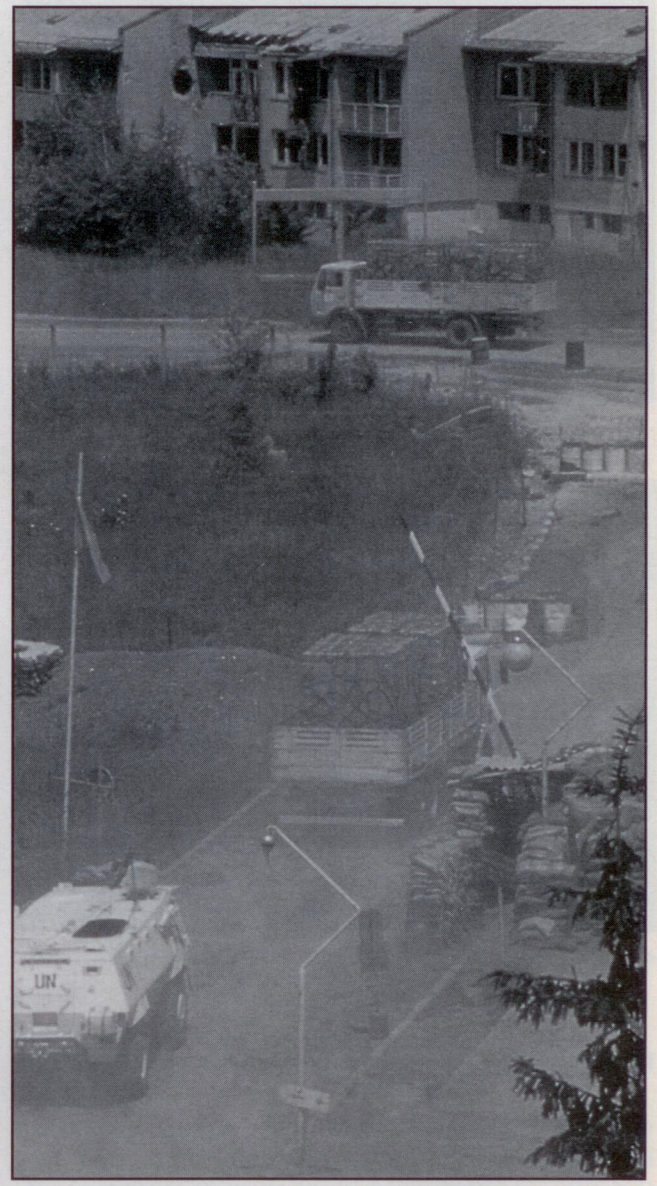
When you're monitoring, it's always helpful to have a couple of station identification publications available. These provide information for stations and indicate the type of station, callsign, frequency, and location when known. A few titles worth considering are *Confidential Frequency List* by Ferrell, published by Gilfer Associates; *Guide to Utility Stations* by Klingenfuss, published by Klingenfuss Publications; and *Shortwave Directory* by Grove, published by Grove Enterprises.

If you're interested in reading more about utility monitoring, two suggested books are *Shortwave Listening Guidebook* by Harry Helms, published by High-Text Publications, Inc. and *Shortwave Radio Listening with the Experts* by Gerry Dexter, published by Howard W. Sams.

In the meantime, you can obtain the latest in monitoring news by listening to a net conducted on the amateur radio frequency of 7240 kHz LSB every Sunday at 1400 UTC. Net



Shipboard radio console. (Photo courtesy of Japan Radio Company.)



UN high commission for refugees convoy loaded with supplies departs Sarajevo airport to deliver their cargo to refugees of the fighting. Listening to military communications is pursued by many hobbyists. (USAF combat camera photo by SRA Andy Dunaway.)

members discuss signals they've recently heard, some of which may be of interest to you!

There are also SWL clubs you can join. Most clubs publish an informative monthly newsletter. One club I'm familiar with is The Association of DX Reporters, 7008 Plymouth Road, Baltimore, MD 21208, but there are many others as well. For a list of popular radio listening clubs send a stamped, self-addressed envelope to The Association of North American Radio Clubs, 2216 Burkey Drive, Wyomissing, PA 19610 and ask for the ANARC Club List.

It's also important to keep aware of changes in the shortwave listening field, so be sure to look into subscribing to *Popular Communications* and *Monitoring Times*. These magazines both carry monthly lists of frequencies as well as in-depth feature articles describing many facets of the listening hobby. ■

Common Utility Communications Frequencies (in kHz)

2182	International distress/safety	10000	WWV time/frequency station
2716	U.S. Navy harbor frequency	10242	U.S. Customs Service
3023	U.S. Coast Guard search/rescue	10493	FEMA emergency net
3067	U.S. Air Force	10637	U.S. State Department
3130	U.S. Navy	10780	U.S. Air Force/NASA
3380.5	FEMA	10891	Federal Highway Administration
4066.1	Navy MARS	10935	U.S. MAG
4087.8	Mississippi River barges	11108	Israeli intelligence
4125	Distress/safety	11552	U.S. Antarctic stations
4415	National Guard	12691	Madrid, Spain
5000	WWV time/frequency station	13267	National Hurricane Center
5190	Space launch support units	13354	National Hurricane Center
5197	U.S. Air Force	13626	FAA
5264	Spy numbers stations	13927	U.S. Air Force MARS
5277	DEA	1436	Polish press
5547	Aeronautical	14383.5	U.S. Navy MARS
5696	U.S. Coast Guard	14405	U.S. Air Force MARS
5703	Canadian forces	14441.5	U.S. Navy MARS
6200	U.S. Coast Guard cutters	14510	U.S. Army MARS
6518.8	Inland waterways	14686	DEA
6756	U.S. Air Force VIP aircraft	15000	WWV time/frequency station
6753	Canadian forces	16463.1	British Navy
6792	Spy numbers stations	16591.5	French Navy
6927	U.S. Air Force	17155	Russian Navy
7527	U.S. Customs Service	18205	Civil Air Patrol
7535	U.S. Navy	18210	Aeronautical
7651	VOA feeder	18358.5	Cuban diplomatic
7675	NASA	18511	VOA feeder
8241.5	U.S. Coast Guard	19440	Radio Moscow feeder
8241	Distress/safety	20000	WWV time/frequency station
8295.5	U.S. Army	20053	U.S. Air Force
8719	Haifa, Israel	20480	FAA
8767	Norddeich, Germany	20623.5	U.S. Navy MARS
8989	U.S. Air Force	20994	U.S. Army MARS
9041	Spy numbers stations	21811	Spy numbers stations
9082	Russian navy	23675	DEA

Mysteries Of Radio

They're out there...lurking...waiting for you to find them—and you can....

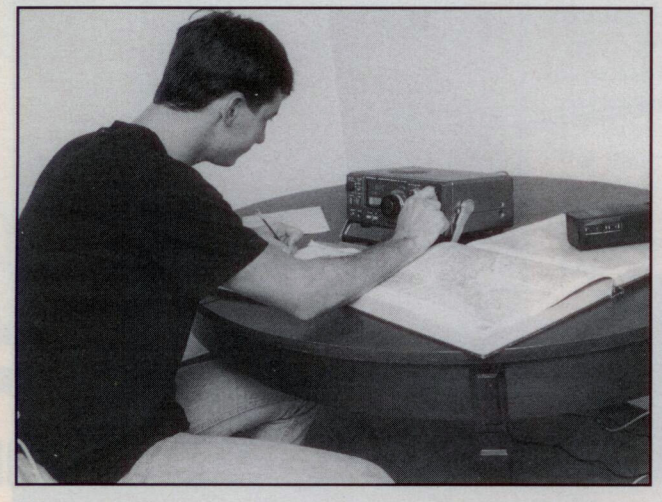
By Myke Weiskopf

You can be safe. You can stay within the boundaries of broadcast band radio, listen to strictly kosher utility transmissions, monitor your scanner, or tune the AM-FM bands. Eventually, despite all your dodging, you will smash directly into one of them.

I'm talking about those mystery broadcasts—"numbers" stations, single-letter high-frequency beacons (SLHFBs), and KKN stations, among others. These broadcasts are of a highly unusual, even eerie, nature and none of the broadcasts we'll be discussing here have been completely explained. (Other less bizarre broadcasts, such as pirate and clandestine radio, have been left out of this article. These stations have a higher profile and addresses are available to contact them.)

First Encounter

My first encounter with these mysteries was fairly innocuous. Time was when I would find an open carrier (a signal with no modulation) to see what might develop and just go to sleep with the radio on. One morning, I woke to hear the following transmission: "5, 4, 1...8, 7...8, 3, 9...9, 1...." And, this strange occurrence was happening right in the middle of the FCC-monitored UTC day!



With map, two-way radio, and note pad, could this fellow be receiving a message from his comrades?

My first reaction was one of utter bewilderment. The obvious question arose: Why is this mechanical-sounding female voice reading numbers? Had I discovered some sort of mechanized math exercise? A shuttle countdown gone horribly awry? I had no idea. Intrigued, I continued to listen. Sure enough, they continued for about 10 minutes before...silence. There was no "end," no "fin," no fanfare—just radio silence.

Letters mailed to FCC personnel and government officials received no response. Nothing, not even a form letter. It took a bit of reading to discover that these transmissions were known as "numbers" stations, alleged spy transmissions and one of many great Mysteries of Radio.

Radio affords great opportunities for all sorts of illicit broadcasting and traffic activity. First of all, it's fairly inexpensive. A quick stop at an electronic chop-shop and a few minutes of (quite illegal) modifications can get someone on the air—illegally. Second of all, it's convenient and inconspicuous. Almost everyone carries a radio in some parts of Europe, so spy activities don't appear unusual. Finally, because of the great cloak of secrecy surrounding most of these operations, the lack of personnel on active duty at each location, and the ability to place a transmitter in the strangest of places, governments have great difficulty in locating either the station or its operators. Let's take a look at the different types of stations.

"Numbers" Stations

The numbers stations are the most consistently recurring of all mystery broadcasts. Ever since these stations made their debut several decades ago, numbers stations have baffled experts and amateurs alike. There are two basic types of numbers broadcasts. The 3-2 format involves a group of three numbers followed by an additional pair (such as "3, 4, 2...5, 6"). These are alleged to be coming from "their" side, in the "us versus them" arena. The 4 format involves a group of four numbers ("6, 2, 9, 1"). These are "ours," that is, transmitted by our country or from our intelligence agencies.

The numbers have been heard in all different languages, from Slavic to Chinese, but are most frequently in Spanish or English. They're usually announced by a female voice,

thanks to a popular psychological study which found that people are more likely to listen to a female's voice than a male's. The voice is robotic, usually produced by speech synthesis (electronic simulation), although one particularly memorable instance was utter havoc—a supposedly drunken male was heard shouting numbers live on-air, with the sound of crashing, doors slamming, and other violent noises in the background. Numbers stations also operate with hand-keyed "cut numbers" in Morse code, which are composed of pure tones and don't require BFOs (beat-frequency oscillators) for clear reception.

Numbers stations cost vast amounts of money to operate. They've overridden the BBC, VOA, military, aero, and all other types of broadcasters imaginable. They often reside on important aircraft and government frequencies, especially ones where there are fixed-frequency monitoring radios, like airport control towers and military stations. They've been found in Cuba, Florida, Colombia, Guam, Brazil, and, most eerily, Warrenton-Remington, Virginia. Here is a basic rundown of their format.

Numbers Station Format

1. *Warning tone*. Some numbers stations broadcast a tone or series of tones to warn the intended recipient of the imminent broadcast.

2. *Announcement of broadcast/agent paging*. Usually with an "Atencion" (Spanish) and always followed by the announcement of the agent's number (usually three digits).

3. *Countdown/equipment test*. Usually "0, 1, 2, 3, 4, 5..." repeated several times, often with the agent's number between tests.

4. *Numbers*. The number list (3/2 or 4 format) is read.

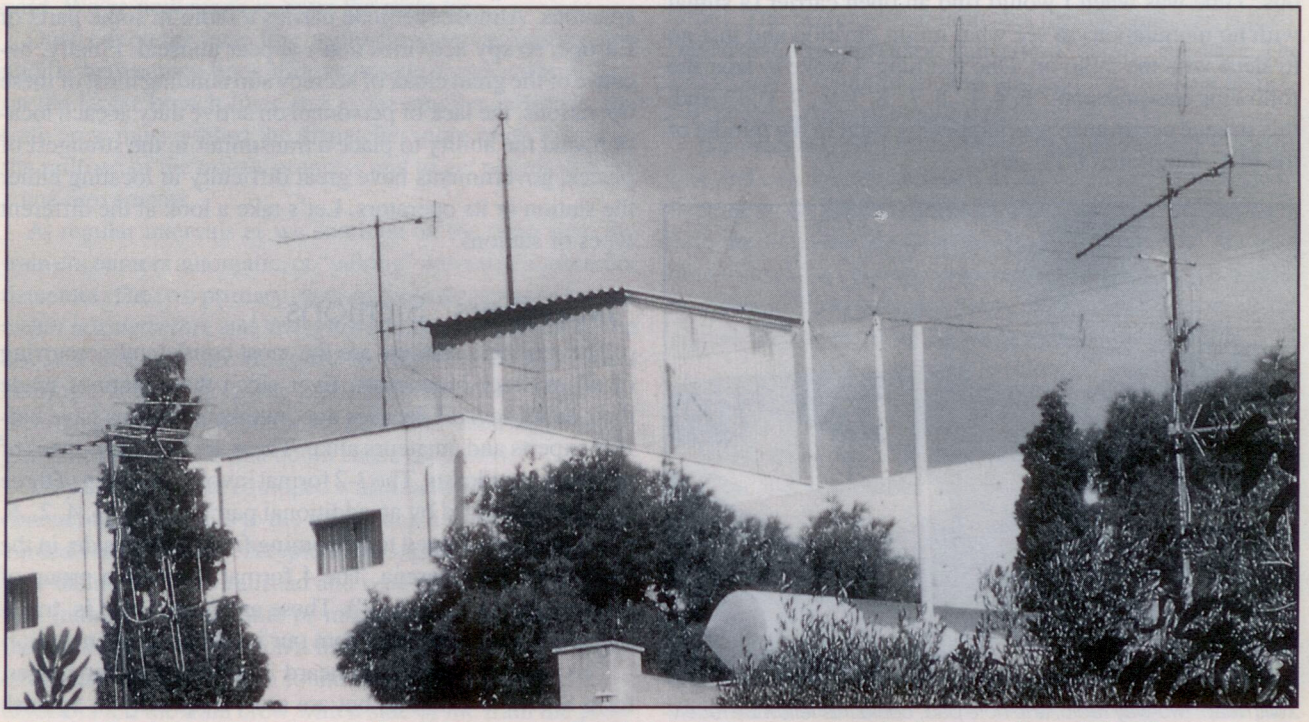
5. *Ending announcement*. Usually "End." Quite often, there will be no announcement; they will merely disappear or the carrier will drop out.

The numbers mystery is so intriguing that there are probably just as many people following these broadcasts as there are following legal stations. Several experts, such as Havana Moon, John Fulford, and Simon Mason, have dedicated years of their lives to the subject. There have been countless articles, books, clubs, and forums dedicated just to the numbers stations. Why?

For one thing, as I already mentioned, when letters are written to federal authorities regarding these broadcasts, there is no reply at all. Since their first appearance 30 years ago, no letter has ever been written by anyone at the FCC in response to an inquiry, despite the pinpointing of exact locations of numbers' transmitting sites (actually visited by several renowned members of the shortwave community). If there's ever been anyone involved in these stations' day-to-day activities, they ain't sayin.'

Most numbers station experts have come to the general conclusion that these stations broadcast as a means of transmission for espionage and intelligence-type communications. There's no other logical reason for their continuous existence over the past decades, or for their continued existence today. As John Fulford points out, "they are not international currency figures, they are not coffee bean prices, they are not drug-related."

Spy numbers are as prevalent in Europe as they are in the Americas, if not more so. They're still around, despite the breakup of the Soviet Union and the alleged resolution of the



Hobbyists aren't the only ones involved in radio communications. Here's an interesting view of antennas on the roof of the Soviet embassy in Athens, Greece. (Photo courtesy of Prof. Desmond Ball, Australia.)

The Berlin Wall and guard towers have been consumed by time, but is it possible that some mysterious radio signals still come from former East Bloc countries? (Photo by Harold Ort.)

Cold War. Here are some handy frequencies you can tune to hear these enigmas for yourself.

4 to 15 MHz—General area, from 0000 to 0800 UTC.

6840 kHz—A *major* frequency for Spanish 4 group numbers at 0230 UTC.

"KKN" Stations

There are several different stations on the shortwave bands which begin with the prefix "KKN" and are followed by two digits, for example "KKN 59." These stations simply broadcast their call signs in Morse code ad infinitum. KKN stations are officially assigned to the U.S. State Department, but their actual purpose is unknown. Some believe that the KKN stations are HF backup systems for state radio stations. Another theory links them to the numbers stations. The latter was made that much more credible when a numbers station was discovered sharing a transmitter with a KKN. Even so, there's no real evidence concerning what they really are. Following are some KKN frequencies.

KKN39, Miami, FL—4956.5, 133387, 13472, 17413.5, and 25545 kHz.

KKN50, Washington, D.C.—6925, 10637, 11455.5, 15970.5, 16363, 17437, 18525, and 23975 kHz.

SLHFBs (Single-Letter High Frequency Beacons)

SLHFBs are the final mystery of radio we'll cover in this article. These stations are easily mistaken for simple Morse code beacons by those who encounter them in passing. The strange thing about these stations is that there are no FCC-licensed beacons which transmit one single digit. SLHFBs pop up in all sorts of bandwidths and have been pinpointed to many strange locations. (One eminent radio expert found an extremely basic low-powered SLHFB transmitter tied between two trees on a deserted beach in Florida!)

As with the other mysteries of radio, there's no explanation for the SLHFBs. They don't seem to serve any known navigational purpose, and no agencies have claimed to use these beacons in their networks. As with KKN stations, they are simply of unknown origin.

Always Listen

New mysteries of radio appear on a regular basis. If you have any other information regarding these or other mysterious stations, or if you have any questions about these stations, please write me at 1119 Parkwood Avenue, Rockford, IL 61107. If you don't have any current information, it's your duty as a shortwave radio user to keep a radio on at all times...you never know what you'll encounter!

A special thanks goes to John Fulford, Havana Moon, Larry Van Horn, and all other fearless mystery investigators—your dedication will crack the mysteries some day. ■

For Additional Information:

Here are a few good sources to learn more about the mysteries of radio.

Secret Signals: The Euronumbers Mystery, by Mason, Simon, Tiare Publications, 1993, P.O. Box 493, Lake Geneva, WI 53147.

Shortwave Listeners Guidebook, by Helms, Harry, HighText Publications, 1992, P.O. Box 1489, Solana Beach, CA 92075.

"Communications Confidential," *Popular Communications*, CQ Communications, 76 N. Broadway, Hicksville, NY 11801.

In Review: The DX-375 AM/SW/FM Stereo Receiver

By Harold Ort, N2RLL

Five seconds—that's all it took. Five seconds to enter a shortwave frequency into the DX-375 receiver and hear the BBC. Push ENTER 1-5-2-6-0-ENTER; it's that easy. Kol, Israel, on 15640 kHz the same afternoon was just as easy!

Here's a shortwave receiver that tunes the SW broadcast bands from 2300-2495, 3200-3400, 3900-4000, 4750-5060, 5950-6200, 7100-7300, 9500-9900, 11650-12050, 13600-13800, 15100-15600, 17550-17900 and 21450-21850 kHz. That's not all, either! It actually covers these specific shortwave band segments (for international broadcast reception) *and* alerts you with the words "SW BROADCAST BAND" in the display when tuning through any of these shortwave frequency segments.

The DX-375 also allows you to tune *outside* the standard shortwave bands, specifically from 2300-6250 and 7100-21850 kHz. This way, you're not limited to only the actual international shortwave broadcast segments. This little gem of a receiver also covers the standard AM broadcast band, (530-1710 kHz) as well as the FM broadcast band (87.5-108.1 MHz). It includes jacks for external power (3 Vdc) and for stereo headphones (not included).

The Radio Shack DX-375 AM/SW/FM Stereo Receiver weighs in at a mere 18 oz (without the two C batteries).

So, How Well Does It Work?

Too many shortwave receivers "overload" with a multitude of signals, especially in places they don't belong, when an outside longwire is connected to the antenna. While there's no provision for an outside antenna (this small receiver—7 1/4" X 4 3/4" X 1 3/8"—is designed to be used with only the supplied telescoping whip antenna), I connected an outdoor longwire antenna to the bottom of the whip. I was amazed at what I heard! Weak signals that were buried in the mud were easily copied. There was very little "overload" using the outdoor antenna. Equally impressive was the reception of signals when the telescoping whip was collapsed.

Now, remember, this receiver is primarily designed for reception of AM, FM, and shortwave broadcast stations—there's no BFO (Beat Frequency Oscillator) or SSB (Single Sideband) switch for listening to utility stations using sidebands or amateur operators on sideband. What there is, though, is plenty of basic features to keep a shortwave or broadcast band listener satisfied while on vacation or when using the DX-375 as a "second receiver."

Here's a rundown of the additional features in the DX-375: The receiver operates on two C batteries (not included), your vehicle's power using the optional 270-1560 DC adapter, or AC power using the optional 273-1654. There's direct key pad entry for frequency selection, or manual up/down keys, if you prefer. There's a total of 30 memory presets, 10 for each band. This means that you can program into the receiver's memory 10 stations in FM, 10 in AM, and the remaining 10 in shortwave. Once set, you can scan through them by simply pressing SCAN. The receiver will stop at each station for about five seconds. To remain on that particular station memory, simply press SCAN again or a preset station memory button.

Pressing the up or down keys makes the receiver automatically find stations for you; just press and hold either key for more than a couple of seconds. The receiver will stop when a signal is detected. Let's take the following example: I began searching at 15,500 kHz by pressing the up button. The receiver quickly stopped on 15,610 kHz (WWCR, Nashville). The red tuning light indicated I had actually tuned a station. Then, to enter the station into memory, I pressed "STORE" (the memory indicator flashes) and then entered a number on the key pad to store the station. The next afternoon, I retrieved WWCR by simply pressing "1." Incidentally, the manual recommends keeping the batteries installed when using AC or DC adapters to protect the receiver's memory. It also states that disconnecting power from the receiver for about an hour will erase all memory information. There's even a low battery indicator, so keep an eye on the display. Replace your batteries more frequently if you use the radio a lot, especially with high volume.

There's also a "DX/LOCAL" switch on the DX-375. Normally, you'll have it set to DX, unless you're listening to a

particularly strong station and the sound becomes distorted. In that case, set the switch to LOCAL.

One of the handiest features on the DX-375 is the plastic folding stand on the back of the radio that elevates it for easier viewing. The frequency readout window is easy to read, regardless, but the folding stand makes it even more convenient. Incidentally, there is no push-button light for viewing the window display at night, but, frankly, most people using the receiver will likely be in a sufficiently lighted room or have a flashlight at the campsite. Besides, repeated use of a dial light eats batteries!

Go to Sleep, Count those Sheep

A sleep timer can be an especially welcome feature on a receiver. Here's how it works on the DX-375. By pushing SLEEP, the word "sleep" appears on the display. This timer sets the receiver to turn off after 60 minutes. So, you get to fall asleep listening to your favorite station without worrying about running down your batteries while the radio runs all night long. If you get tired of listening, simply press POWER to turn the DX-375 off.

Locking the Controls

The receiver's control lock capability is particularly useful for travelers or in case other folks might accidentally (on purpose) fuss with your settings. The lock prevents the receiver from being turned on or off, or the frequency from being accidentally changed. While the volume, tone, and sensitivity controls are still available, the sliding top-mounted LOCK/IN switch locks all other controls on the DX-375. What's particularly good about the DX-375's lock switch is that it can't be accidentally pushed. Remember—it's a slide switch! So, when the radio's packed away in your suitcase with the lock activated, you can be certain that you won't arrive at your destination with dead batteries.

The Bottom Line

If you need a good (actually, great!) basic shortwave receiver that also has AM and FM coverage, consider the DX-375. I found the audio particularly good—loud enough to let everyone in the room easily hear what you've tuned. There are plenty of "extras," too. For instance, Radio Shack went a step further by including an AM/FM frequency increment switch in the battery compartment. On many receivers (even on more expensive models), there's no way to switch from the U.S. 10 kHz (AM) or 200 kHz (FM) increment standard to the overseas standard of 9 kHz and 100 kHz increments. Open the battery compartment for easy access to this important switch. Very thoughtful, Radio Shack!

But you don't have to be an international traveler to want the DX-375—just someone who likes to hear what's going on in the world or across town on the AM or FM band. If you already have a base communications receiver, what do you do when the power goes out? Get yourself the DX-375 (it's only $100!) and a couple of C batteries! ■

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Citizen's Band And GMRS In Public Service

Whether used to help during fire-fighting, accidents, or natural disasters, CB and GMRS are community and lifesaving radio services.

By Walter G. Green III, CB Committee Chairman, REACT International

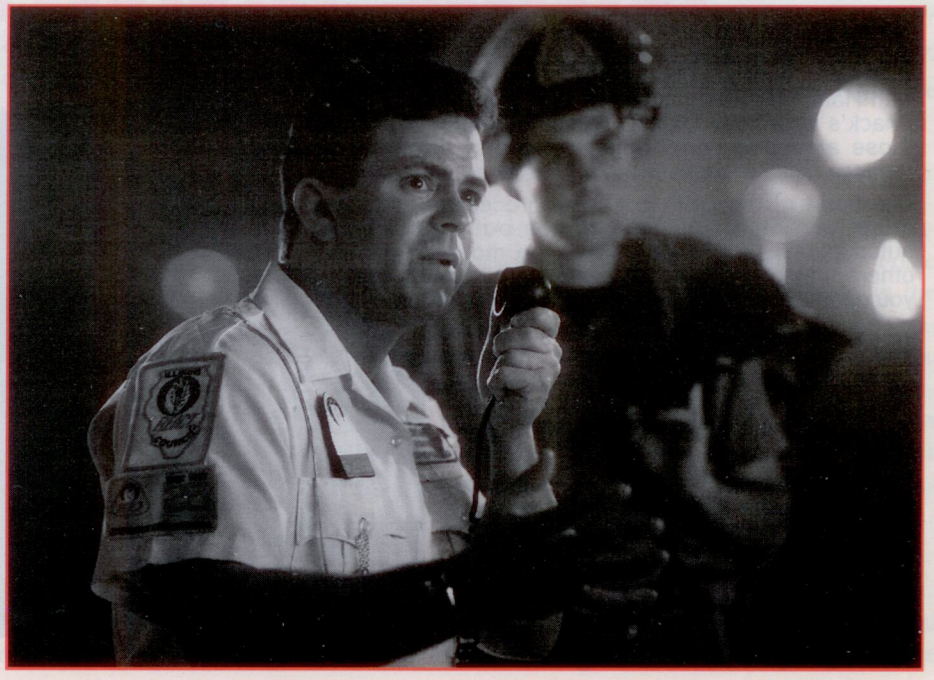
Possibly the most rewarding aspect of radio is the ability to put the service to use in helping others. All across the country, thousands of dedicated men and women train, listen, observe—and act—to do just that. Here are just a few of the many ways radio communications is used for the public good.

Facing Down Fires

West Suburbs REACT in Oak Park, Illinois, keeps busy as a key part of their community's emergency response to suburban fires. In just three weeks during January and February of this year, the team was called out for three major fires, one of which severely damaged the River Forest Police Department's headquarters.

During the first fire, 13 team members responded in their vehicles within 10 minutes after the initial alert at 9:30 p.m. Until relieved by Illinois State Police troopers, they helped police close off a major street and re-route traffic to allow response vehicles to stage at the fire scene.

Another fire emergency occurred on August 8, when a fire did $200,000 worth of damage to a house in River Forest. Again, team members responded within minutes, providing traffic control using licensed General Mobile Radio Service (GMRS) radios on the national emergency frequency of 462.675 MHz. During large fires, traffic control is a vital function, keeping normal traffic moving around the incident with minimum delay and allowing emergency vehicles to enter and leave the scene safely.



Dedicated REACT members have long been among the leaders in emergency communications.

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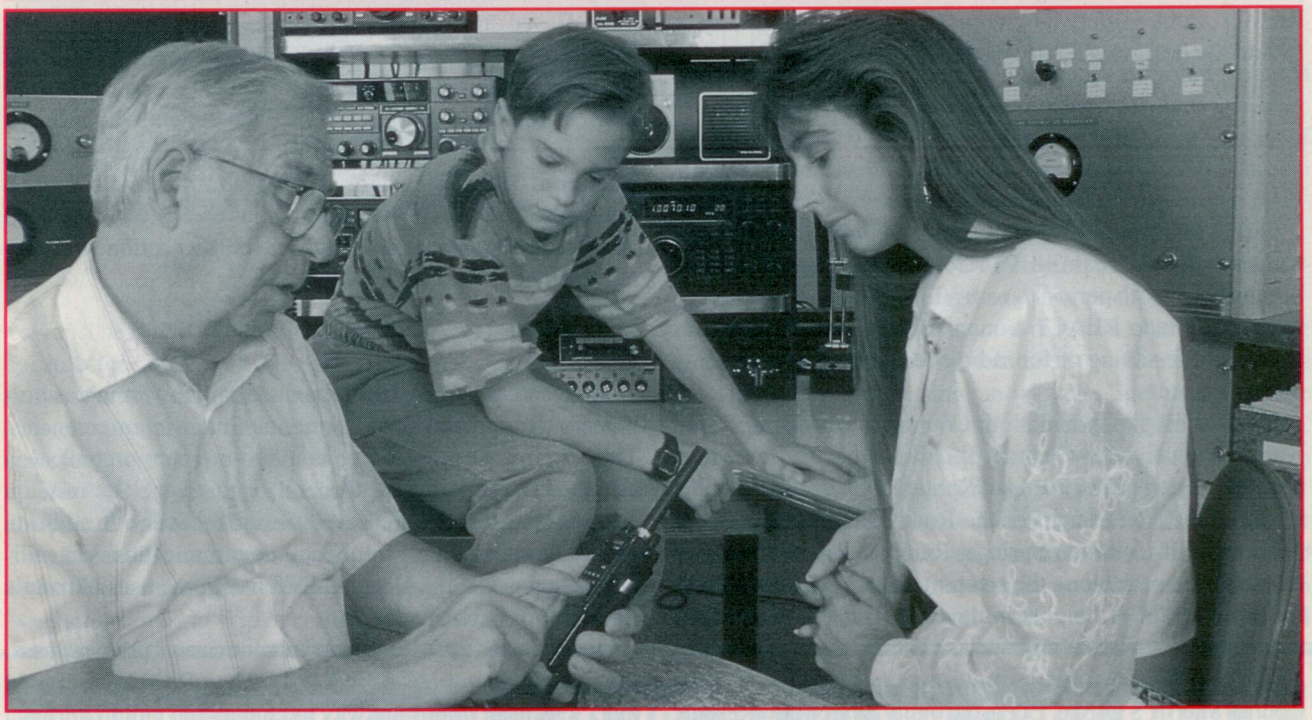

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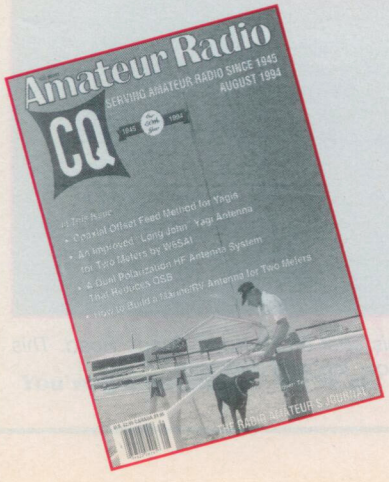

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When faced with emergencies like these, West Suburbs REACT uses GMRS extensively to avoid heavy congestion on the Citizen's Band in urban areas. But Team Secretary, Joan Shrigley, points out that the team also uses scanners—a vital part of their emergency communications. Scanners provide the first alert that a major incident is developing and allow public safety agencies to provide instructions without tying up response channels. GMRS, CB, and scanners are all part of an effective emergency communications network for REACT. Public safety communicators need to be inventive to find the best ways to use each of these tools.

Colorado REACT Member Earns Life-Saving Award

Early this Spring, Richard Garcia, Deputy Chief of High Country REACT Team 4817 in Colorado Springs, Colorado, became the fourth person to earn a Life-Saving Award given by the Colorado REACT Council. The award is given for hands-on life-saving or for radio coordination of extremely difficult rescues.

It was 8:30 p.m. when High Country Team Chief David Espinosa received a Channel 9 call for help from a man trapped in a camper on Rampart Range Road. Rampart Range is one of the front ranges of the Rocky Mountains, several miles west of Colorado Springs. Rampart Range Road is a one-lane dirt path along the steep mountainside, not a drive for those afraid of heights in daytime. But this was nighttime—and it was snowing!

The call for help started a multi-agency response. El Paso County Sheriff's Office, El Paso County Search and Rescue, and an American Medical Response (AMR) ambulance were all dispatched. Sheriff's deputies were fully committed to other problems, El Paso County SAR (one of the best search and rescue teams in the entire country) was heavily involved in another rescue, and AMR's ambulance was unable to climb the icy road. REACT member Rich Garcia was one of the respondents to the call. He was close and could get to the camper quickly in his 4-wheel drive vehicle.

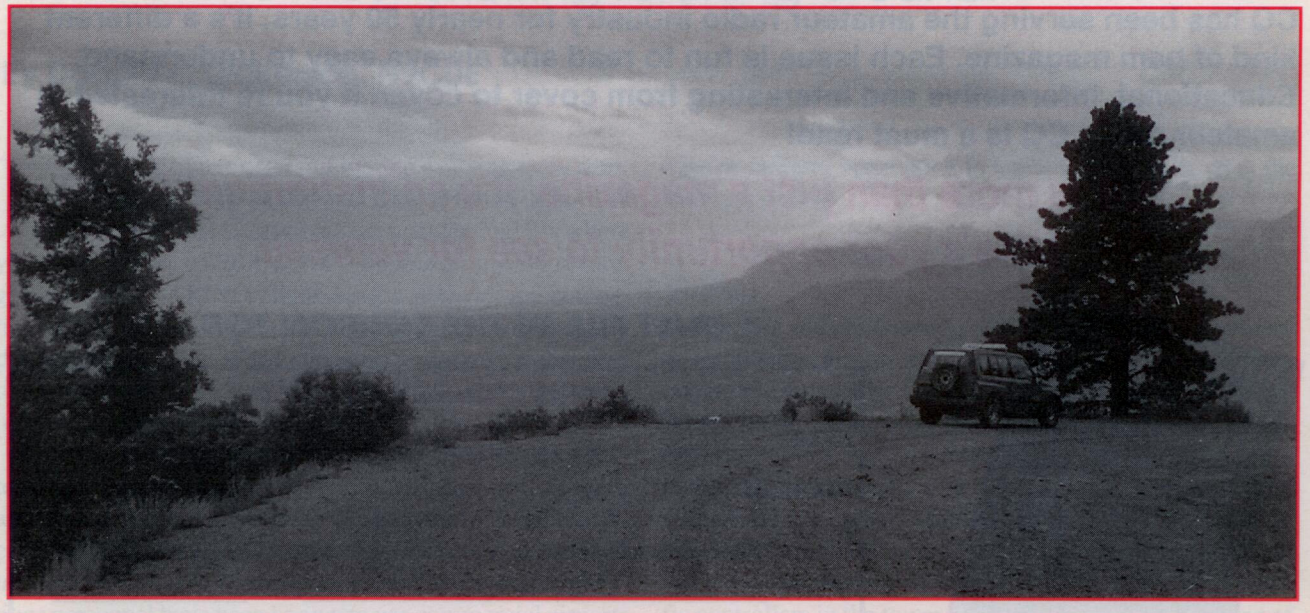
Upon reaching the scene, Garcia found the person who called for help, unconscious, overcome by carbon monoxide, in the back of the camper. Garcia quickly pulled the man from the camper into fresh air and started first aid.

By this time, AMR's vehicle was still 30 minutes from them. Based on reports from the scene, Dave Espinosa, a critical care nurse, assessed that the patient was unstable and authorized Garcia to transport him down the mountain until AMR's vehicle could meet them. The patient was successfully transferred to the ambulance and transported to Memorial Hospital where he was admitted with carbon monoxide poisoning. The paramedics and doctors on hand credited Richard Garcia's quick and correct action with saving the man's life.

State Defense Force Uses CB

State defense forces are organized militia serving as volunteers to supplement the National Guard in emergencies. The Virginia Defense Force is a 500-member organization assigned to the Adjutant General of that state. Its mission focuses on major disaster response and recovery. In addition to high and very high frequency communications on military frequencies, the Virginia Defense Force uses Citizen's Band radios extensively.

During a recent exercise to test hurricane preparedness, the Force's operations officer, LTC Kent Brinkley, stressed that, "CB is an important way to contact the public during a disaster, to gather information on disaster effects and to give instructions to motorists for evacuation. Vehicle-mounted CBs may be the only public access communications working in the disaster area." Colonel Brinkley went on to point



A camper with a man who was overcome by carbon monoxide poisoning was parked at this spot on Rampart Range Road. This summer picture doesn't even hint at the actual severe conditions, including snow, ice, and darkness.

A Virginia Defense Force communicator uses a packaged emergency radio station during a Hurricane Debra exercise. In the foreground is a Radio Shack TRC-226 CB radio which was used to coordinate amateur packet operations.

out, "after any disaster, there are many volunteers willing to help—often the only communications they have is CB."

In their May training at Fort A.P. Hill, the Virginia Defense Force's 3rd Brigade used Citizen's Band radio to maintain contact with its units during search and rescue and radiological monitoring exercises. Fort A.P. Hill is on rolling, mostly forested, countryside. A 16-year-old Radio Shack model TRC-449 radio combined with a Hustler RM-11S Super Resonator antenna and a field of four-wire ground radials behind the communications officer's vehicle successfully worked stations six miles away to control operations. The Virginia Defense Force is working to develop new antenna systems and techniques to make CB more effective as a disaster management tool.

The Big Enough One—Los Angeles

After it was over, earthquake experts said it wasn't the much-feared and long-awaited "big one." For the volunteer emergency communicators it was "big enough"! In the disaster area, San Fernando Valley, Southwestern, Tri City, Long Beach, Orange County, Oxnard Mabuhay, Antelope Valley, Riverside, and Mojave REACT teams responded. REACT teams from as far away as San Antonio, Texas, and Washington state provided supplies, equipment, and standby teams in case further quakes occured.

One of the lessons of any major disaster is that there's never enough communications. REACT members were given the tasks of keeping communications working between shelters managed by the Red Cross, conducting damage assessment, and assisting in mass feeding (the Red Cross fed over 45,000 meals in one day out of one Chapter!). REACT communications included Citizen's Band, amateur operations, and General Mobile Radio Service (GMRS) using the extensive GMRS repeater system in southern California.

Pat Dougherty of the San Fernando Valley REACT highlighted some important lessons learned that can apply to volunteer communications in any disaster:

1. Keep a written log of all your communications. It should include time, station calling, message, and how the message was delivered.

2. Keep a roster of who's working. It should include name, address, phone number, call sign and/or unit number.

3. Maintain a careful inventory of all equipment to be issued and never give out a piece of equipment without some form of property loan record indicating who received the item, what agency, etc.

4. Start a staffing process early, managing the people available so you can meet all requirements.

5. Always try to have backup systems, like phones, cellular phones, pagers, and radios, so you don't have to rely on only one type of communications. ■

Questions about REACT?

Here's how to get in touch with REACT. Write to REACT International, P.O. Box 998, Wichita, KS 67201, or phone 316-263-2100. The Virginia Defense Force can be contacted at P.O. Box S, Sandston, VA 23150, or by phone at 804-328-3037.

Those Helping Hams

Who says you can't get somethin' for nothin'? Not ham operators!

By Gordon West, WB6NOA

Licensed amateur radio operators put a high priority on helping newcomers get started in our hobby. Many hams spend hundreds of hours a year "specializing" their talents for free-of-charge help to new hams.

Handicap Licensing

Washington State ham operator, the late Gordon Gunnels, KB6BUN, recently gave us a viewpoint shared by many quadriplegic hams, "When local hams are out there on the highways needing traffic advice or roadside assistance, we can patch them through to the proper authorities in a matter of seconds over our 2-meter transceivers." Gunnels added, "I use an automatic phone dialer that was preprogrammed with all of the local emergency numbers by fellow hams. And even though I'm able to just barely raise a finger, I can still dial out for help and clearly communicate over my little handheld transceiver."

Gordon Gunnels was recently awarded a posthumous communicator's trophy for the many years he spent providing traffic reports and emergency calls for local motorists on his 2-meter radio set up.

Licensed amateur operators with *any* physical disability can receive valuable information and assistance from Courage Handi-Ham Center, 3915 Golden Valley Road, Golden Valley, Minnesota 55422, 612-588-0811. For instance, Handi-Hams offers their visually-impaired members audio cassette courses from Gordon West Radio School covering all levels of amateur radio licensing.

On-the-air International Handicap Net News can be found Monday through Saturday on the amateur radio 20-meter band, 14.287 MHz, from 1500 to 1800 UTC. Free membership in the net, along with their informative newsletter, is available by sending a 10 X 13" self-addressed envelope with five stamps on it to IHN Net News, 300 Luman Road, #40, Phoenix, OR 97535.

Free Military Training

Amateur radio operators who've served in the military will enjoy going back in time to get "re-enlisted" in MARS (Military Affiliate Radio System). The MARS program is sponsored by the Department of Defense and is separately managed and operated by the Army, Navy, and Air Force. Licensed amateur radio operators will contribute to the MARS mission, providing auxiliary or emergency communications on a local, national, and international basis as an adjunct to normal radio communications. "Free military surplus parts, antennas, and radio equipment may become available to us if we regularly keep our minimum required operating MARS schedules," commented John Palmer, N6OSN. "It's fun to pass worldwide and long-range radio traffic over high frequency, too," adds Palmer. One of the fringe benefits of joining MARS with any grade of amateur radio license is that you're allowed to work on their worldwide high-frequency bands adjacent to ham bands restricted to the General class (or higher) licensee. Many no-code Technician class operators love the thrill of high-frequency operation over long-range MARS single-sideband frequencies.

Helping Ham Volunteer Examiners, Marc Churgel (left) and Lloyd Harwood, give a test to a disabled applicant who passed with a 100 percent score. (Photo by Gordon West.)

Here author Gordon West is shown teaching a free amateur radio class for both kids and adults offered through the Boy Scouts of America.

This Army MARS station uses a mobile whip mounted on a balcony for great long-range results. (Photo by Gordon West.)

You can join either Army, Navy-Marine Corps, or Air Force MARS, but you may join just one MARS service at a time. Licensed amateur radio operators may send a request for application forms to the appropriate MARS representative. For more details and contact information, see "MARS and You" in this issue.

Florida Prepared

The Everglades Amateur Radio Club (1044 N.E. 4th Avenue, Homestead, FL 33030) is working closely with the city of Homestead Emergency Operations Center (EOC). "We are looking for more of our members to sign up with the EOC and would tentatively like amateur radio assistance with the SWAT team when they are deployed," commented Darrell Day, KB4ONU, president of the club. The Everglades Amateur Radio Club members were credited for the hundreds of hours they put in prior to, during, and after the devastating hurricane that wiped out all regular public safety communications systems. Amateur operators throughout the world take great pride in staying on the air when everything else might get blown away.

Hams Say "No Problem"

In Alabama, more than 70 amateur operators in 10 counties participated in the state's 2-meter weather spotting net and provided emergency communications following several major storms. The National Weather Service in Birmingham credits hams with numerous funnel cloud reports via the W4CUE repeater station of the Birmingham Amateur Radio Club. Carol Boothe, KE4HJU, was cited for her service as net control on the 2-meter net during a recent Sunday afternoon of local tornado activity. Spotting reports were relayed to the State Red Cross headquarters in Atlanta on amateur radio high-frequency channels. "Doppler radar is wonderful," commented the weather service, "but the human eye of the ham operator is the best weather instrument yet."

Morse Code on 2-Meters?

Finally, amateur operators continue to train other hams to learn the Morse code, upgrade their code skills, and then increase speed to pass the General 13-wpm code tests. More and more 2-meter MCW (modulated CW) code nets are starting up throughout the country. This allows new hams who may only own a 2-meter mobile or handheld transceiver to regularly take part in code practice, right on the 2-meter band which normally has little or no code on it at all. "We feel code practice on 2-meters is an important service that our club can offer on a twice-a-week basis," commented Bob Davis, KG7IY, Chairman of the Sierra Nevada Amateur Radio Society. "If you plan to visit Reno to watch the Fall colors, be sure to bring your 2-meter rig and some scratch paper to copy the code on 147.000 MHz or your HTX-440 handheld on 440.800 MHz," adds Davis. "Only over ham radio can you take your upgrade class right in the comfort of your home, car, or hotel room," said Davis.

And only on ham radio do you get all of these volunteers giving of their free time to help others enter the hobby and to support the community around them with emergency communications! ■

Ham Radio Happenings

The latest word on developments affecting the Amateur Radio community.

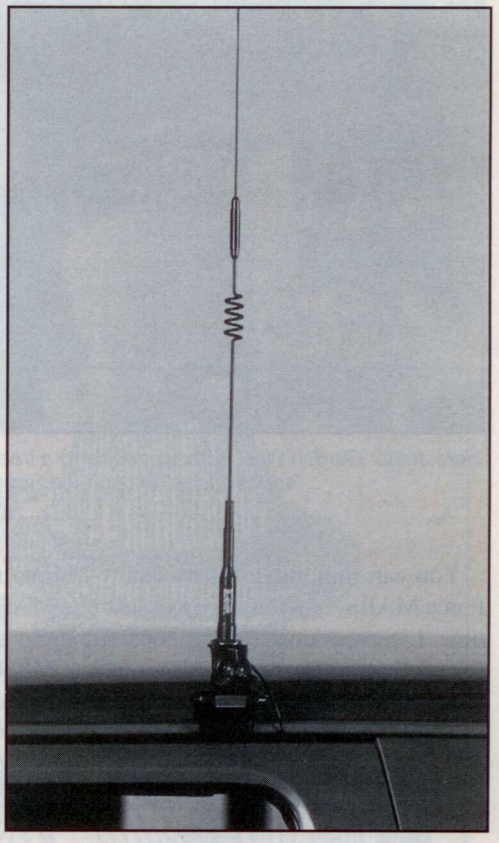
By Gordon West, WB6NOA

Amateur radio licenses are still free! Most other radio services must now pay hundreds of dollars for new and renewal permits!

Except for the ham licenses, all other radio services will require a new fee, to be assessed and collected pursuant to Section 8 of the Communications Act. The new FCC fee program will assist the Commission in recovering costs incurred in carrying out its radio enforcement, radio policy and rulemaking, user information services, and international activities. "Regular ham radio licenses and renewals will still be issued free," commented an FCC spokesman from the Gettysburg, Pennsylvania, licensing facility.

The Gettysburg facility has now switched over to its new computer system of amateur radio licensing, resulting in ham tickets for new operators arriving just days, rather than months, after passing the test. The new computer will also split the Technician license classifications into Technician no-code, and Technician-plus, that is the Tech class "plus" the code at 5 words per minute (wpm).

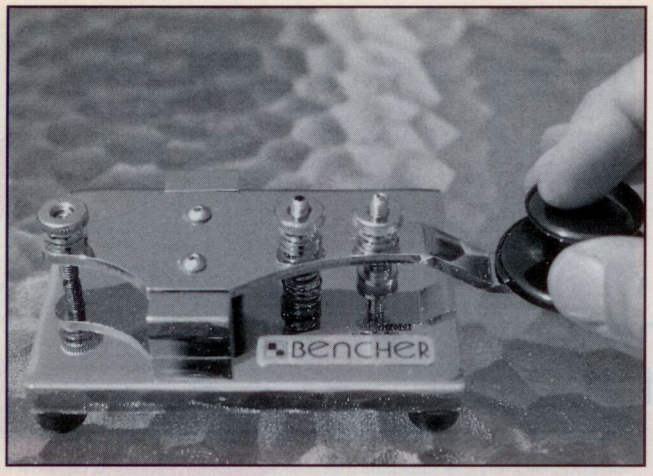
Speaking of code, the amateur radio industry team of recruitment experts is recommending that all ham operators consider the benefits of slightly reducing the General class code speed requirements—from the present 13 wpm, down to 10 wpm. "A slight reducing in code speed might allow thousands of hams to upgrade to General class without getting stuck at the customary 10 wpm speed plateau," commented a representative of one of the amateur radio publishing groups. The 10 wpm is about the maximum speed that someone copying the code can listen to a character, write it down on a sheet of paper, and get ready to copy the next character. Anything faster than 10 wpm normally requires the applicant to "write one and hold one," meaning pencil in the received code character while simultaneously listening to the next character coming out of the speaker or headphones. "Professional code operators can 'hold' as many as three or four characters at a time while writing down the original character, but for the beginner, this may be a little too much to earn the General class ticket," commented Bob Helms, an amateur radio instructor. Interested ham operators are invited to comment to the FCC in Washington, D.C. on any proposed notice of rulemaking. This procedure truly allows hams to shape the future of their radio service by expressing their approval or disapproval of any rulemaking that will affect their hobby.



Two-meter mobile whip antennas for RVs don't need to be very tall, as the Wally Byam Caravan Club knows. (Photo courtesy Comet.)

Self-Policed

Ham radio operators protect their airwaves themselves with little or no intervention by regional FCC monitoring personnel. The Amateur Auxiliary to the FCC's field operations bureau is part of the Communications Amendment Act of 1982, passed by Congress and signed by the President. The Act authorizes the FCC to formally enlist amateur volunteers in monitoring the airwaves for rule violations. This is a crucial assignment for the amateur community as government belt-tightening does not, and will not, provide the FCC's field operations bureau (FOB) with the necessary resources to monitor the ham bands. It is the ham community itself which maintains order and traditional high standards on the amateur bands.



The Morse code requirements for General class may be reduced slightly in speed. (Photo by Gordon West)

The national simplex calling frequency for all mobile stations on 2-meters is 146.520 MHz. (Photo by Gordon West)

Ham operators who want to become members of the Amateur Auxiliary must have complete working knowledge of the American Radio Relay League (ARRL)-developed Amateur Auxiliary training guide. To be appointed as an "official observer," a ham must obtain and review the Amateur Auxiliary training guide, other supplementary literature, and an open book examination paper which tests knowledge of self-regulation. For more information, hams should write to the ARRL, OO Division, 225 Main St., Newington, CT 06111.

DXpedition to Montserrat

Four very new "YL" (lady operators) hams recently went on a DXpedition to Montserrat in the Caribbean to prove to other hams, and themselves, that even new hams can do things that many thought only older hams could do. Gayle, KM6WF, Nancee, N6ZRB, Ellen, N6XJM, and Janet, AB6MP, successfully made the landing and started calling CQ VP2M/N6ZRB. "I really enjoyed working the beam antenna and listening to the hundreds of signals giving us a call," commented Ellen. "It's terrific being at the other end of a pile-up!" echoed Nancee, N6ZRB. "Usually rare DX locations are only operated by old-time hams, but we changed all that—and we'll probably do it again soon," added these four YL ham radio operators.

Band Openings

This past summer's ionospheric activity continued to hold terrific excitement for the new ham with a no-code license. "The no-code Technician class license allows us operation on 50 MHz and higher—and these are bands that normally don't skip off of the ionosphere," commented Ron Spencer, KB7ZJA. "There were several 6-meter (50-54 MHz) band openings several days in a row that really gave me a taste of skywave ionospheric DX," added Spencer. There were also several reports of sporadic-E long-range communications off the ionosphere on 2-meters. These "ionospheric openings" on the 2-meter band only lasted for about 15 minutes.

Annual Wally Byam Caravan Club

This club continues to be a fun gathering of recreational vehicle enthusiasts who may also share an interest in radio. Each caravan may be broken up into separate divisions of amateur radio operators and CB radio operators. "Almost all recreational vehicles have a CB set," commented John Lewis of Chicago. "We use Channel 14 for our caravan frequency, and our range between RVs is usually up to five miles. There is usually a ham unit at the beginning and end of the caravan to ensure we all stay together," added Lewis.

Amateur operator, N6RUI commented, "Our caravans normally stay in touch on 2-meter simplex 146.430 and 146.550 MHz—but we monitor 146.520 MHz, too, because this is the national simplex calling channel." The popular Radio Shack HTX-202 was a favorite for many RV users because it's one of the few handheld 2-meter transceivers to feature a pass-band filter network specifically to tune out annoying interference on frequencies outside the amateur radio 2-meter band limits. "The steep filter skirts make this radio ideal for hook-up to an external RV antenna system without interference," commented N6RUI.

Upcoming Meteor Shower

Finally, hams are gearing up for this winter's December Geminides meteor shower. With the right antenna system, hams can momentarily communicate over hundreds of miles off the trails of incoming meteors. Very large meteors will leave a trail of ionized particles so dense that even FM communications is possible for up to five seconds on the 2-meter band. But you'll need to be a night owl to take advantage of the Geminides meteor shower: the peak of the activity is usually well into the wee hours of the morning. But that's what ham radio operators like—a little challenge when everyone else is asleep. It's no big deal to talk over a couple hundred or a couple thousand miles on the normal ham radio methods—but to bounce a signal off of a meteor trail, that's something else. It's just one more thing that adds to the excitement of ham radio in the Fall and Winter months ahead!

Destination...MARS!

Plenty of hams, just like you, are already on MARS—and at the forefront of emergency communications.

By Lorraine S. Matthew, N4ZCF, AAA9PR

Welcome to MARS! Don't look for any canals or a red planet, though. Look, instead, for the finest assembly of volunteer radio operators to be found anywhere.

The MARS (Military Affiliate Radio System) organization is a group of FCC-licensed amateur radio operators who are interested in military communications and electronics, and who are equally interested in providing service to their community, state, and country. These operators work in conjunction with military stations to provide backup services to the military branch with which they're associated. Its evolving emphasis on providing early information and communications in times of emergency or disaster has brought MARS to the forefront of federal agency communications as well.

MARS is an official Department of Defense and Department of the Army, Air Force, or Navy sponsored communications system. MARS has official status, is assigned missions and functions, and is authorized the use of assigned military MARS frequencies.

The MARS frequencies lie outside the amateur bands. They're far too numerous to list here, but they include HF frequencies 6997.5 kHz, 4042.5 kHz, 5401 kHz, 3292 kHz,

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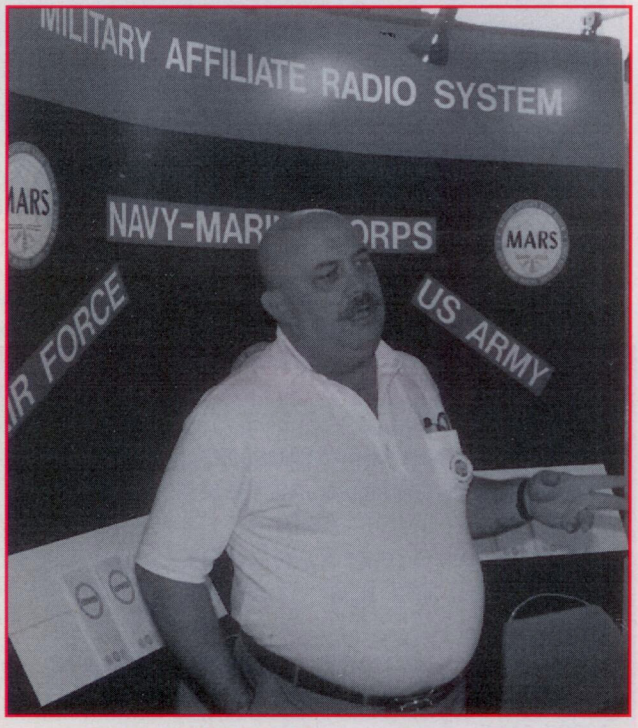
CIVILIAN SUPPORTING AGENCIES
Lending A Hand . . .
Throughout our nation's history, various civilian organizations have supported the USAF and our other armed services in many capacities, in peace and war. Such assistance in the 20th century has provided civil defense services, entertainment, medical care, recreational facilities, emergency aid with personal problems, and family assistance to promote the well-being of the military man or woman. Sometimes this is done at extreme risk to the civilian's own safety. In November 1950, in Korea, Marines wanted to decorate a man who helped drag others to safety from Chinese sniper fire. He replied: "I'm supposed to do this work; I'm the Red Cross man with the 7th Division." Often these agencies receive no government support but rely on contributions and the efforts of volunteers. Highlighted here are activities of some of the many civilian organizations which have been involved in support of the Armed Forces.

This MARS In History display can be visited at the Air Force Museum at Wright-Patterson AFB, Ohio.

Here's quite an impressive array of mobile communications gear at the ready in a MARS member's truck.

The author, Lorraine S. Matthew, AAA9PR, conducts a MARS net.

and 13975 kHz. The frequencies can be USB or LSB according to the assignment given to each area and state. During a recent exercise, operations were conducted on the same dial frequency on each sideband and no interference was detected. VHF frequencies, too, straddle the amateur bands with 143.99 MHz, 148.5 MHz, and others.



Tom Tucker, NNN0GAA, Navy-Marine Corps MARS (AL) Region Two Director, speaks at a hamfest about MARS programs.

A Brief History

In November 1925, the Army Amateur Radio System (AARS) was begun by a few dedicated pioneers in the United States Army Signal Corps. This organization continued until the U.S. entered World War II, when all radio amateurs were denied use of the air waves. While the activities of the AARS were suspended, many of the original AARS operators served in the war in both military and civilian capacities.

Thanks to this group of trained radio operators, the services began to realize the benefit to the nation's interests of maintaining a pool of trained personnel. The U.S. Army, in particular, quickly recognized the great importance of reactivating the AARS to train vitally needed communications personnel at a relatively inexpensive direct cost to the U.S. government. So, in 1946, the AARS was reactivated and functioned as previously until the creation of the Military Amateur Radio System in 1948, later renamed the Military Affiliate Radio System (today's MARS). The Air Force MARS was also established at about the same time. In early

1963, the Navy-Marine Corps MARS was established. The Ships Afloat MARS service of the Navy is still another organization with its own unique function.

A Growing MARS

MARS has grown in all of the services throughout the world. The services and their MARS programs rely on a large pool of civilian and military MARS members to be available in case of emergency or disaster to provide communications support. One of the better known MARS communications support functions has been the health and welfare (morale) traffic extended to the military person and his or her family and friends. This, too, in times of national or international strife, takes on the proportions of emergency support. Morale has been described by several military leaders as a most vital ingredient to the success of any military mission. Each military service has recognized the effectiveness of its MARS program in maintaining morale, as well as in providing other crucial support.

Membership Qualifications

An amateur may join the MARS organization of only one service at a time and must meet certain qualifications. The applicant must be at least 17 years old (18 for Navy-Marine Corps MARS), be a citizen of the U.S. or a resident alien, possess a valid FCC license, and maintain a station capable of operating on MARS HF or VHF frequencies. Amateur radios must be modified to transmit on military frequencies. Most modifications are relatively simple and are done at the expense of the owner-operator.

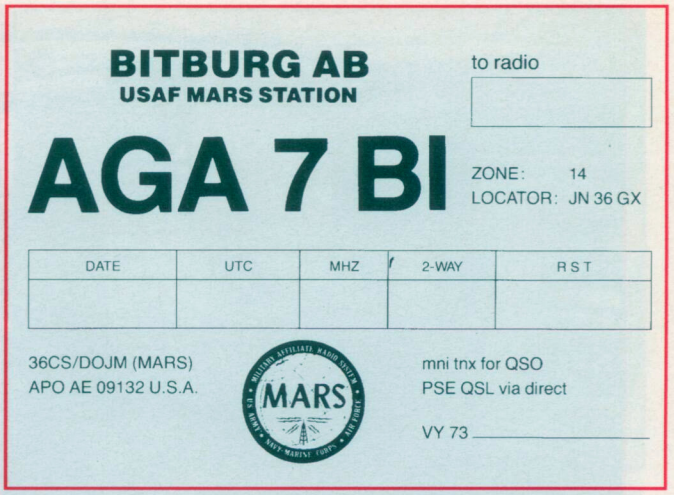
Members must be willing to give the service a minimum of 12 hours per calendar quarter, with six hours on the air for the Army and Air Force MARS. Navy-Marine Corps MARS requires 18 hours per calendar quarter with 12 hours being spent on the air in their area or on regional networks. A report of participation must be filed each month.

MARS Benefits You, Too

One of the main advantages of MARS membership for the beginning ham is that MARS accepts all classes of licensees. The Technician and Extra class licensee have the same operating privileges, which include all modes of HF and VHF. Novice licensees are accepted, but must upgrade within a period of months.

The experience and training given within the MARS framework are unmatched anywhere within the radio community. To join a group of such dedicated operators and to participate in meaningful public service through the MARS system is to know the feelings of pride and accomplishment. The nets' members participate in a unified purpose with structure and discipline, which provides the basis for effective communications...particularly in a crisis situation.

MARS is also constantly monitoring and participating in the newer high-tech modes of operation. These modes are *not* intended to replace HF/VHF radio modes, but instead to add further value to MARS communications. The blend of all modes of operation, old and new, can mean a dramatic increase in the effectiveness of MARS.



A QSL from Bitburg Air Base (Germany) MARS station, AGA7BI.

Why Not See for Yourself

If you're interested and meet the qualifications, you, too, are welcome to join MARS. You're welcome to share in the many public activities in which MARS is represented. Stop by our booths at hamfests, or if you have a friend or loved one who's already in the service, make use of the MARS traffic systems.

Tuning a MARS station is easy, too. If you're a shortwave listener, calls with the AA prefix designate Army stations, an NNNO prefix designates Navy, and AFA or AGA designate Air Force.

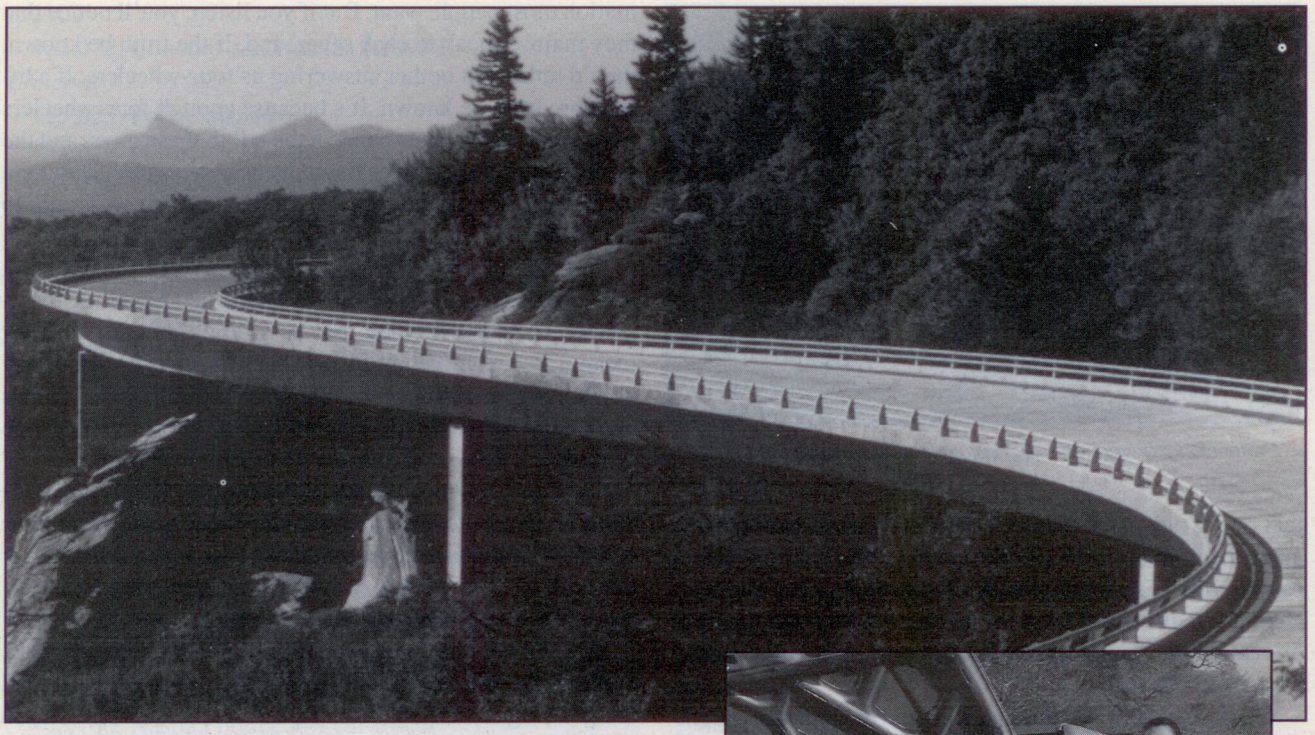
Or simply write for more information to one of the services listed in the box below. MARS welcomes all of you to help it make a difference! ■

MARS Organizations

Army MARS—Chief Army MARS, HQ, USAISC, ATTN: ASOP- HF, Fort Huachuca, AZ 85613-5000.

Air Force MARS— Chief Air Force MARS, HQ, AFCC/DOOCC, Scott AFB, IL 62225-6001.

Navy-Marine Corps MARS— Chief Navy-Marine Corps MARS, Naval Communication Unit, Washington, D.C. 20397-5161.



Using Your CB On The Road

A veteran CBer tells you how to get the info you want, and more, even without talking like a trucker—though it doesn't hurt!

By Bill Price, N3AVY

When you need help on the highway, use your CB and ask for it. Get to the point: the nature of your problem and your location. Repeat the message frequently. Channel 9 might be your best bet to summon assistance, but don't overlook the possibilities of Channel 19!

Since 1965 when I began using CB, I've seen the operating trends come and go. And when they go, they go in a big way.

First someone would ask for a radio check, for instance. Then within a week everyone in the world was asking for radio checks. Soon, when someone would ask for a radio check, you'd hear, "I got mine!"..."Me too"... "Mine's right here—how 'bout yours?"

Things get old fast on CB, and right after "Good Buddy" went the way of old CB call letters, professional drivers got really tired of hearing, "Howzitlookin' over your shoulder—sorry—I can't help you—I just got on."

I've been blessed with the ability to sound just like a trucker when talking on CB. It's a trick I have some fun with from time to time. Some people sound that way naturally, and some can learn it (alright, I confess, I learned it). Now lots of professional drivers answer me, and a lot of four-wheelers call to ask howzitlookin' over my shoulder...then they apologize and say they can't help me 'cause they just got on.

It didn't take long to figure out why professional drivers have better things to do than answer, "how 'bout a northbound 18-wheeler on this-here superslab?" When you've finished reading this article, you, too, will have picked up some tricks that'll let you find out everything you need to know about the road you're driving on and how to make some new friends on the air.

For Starters

Right up there at the top of the page under my name is my amateur radio call sign. I'm a ham—have been since 1973—and some of you may think that because of that I wouldn't be caught dead using CB radio. Well, don't bet the farm on

Professional drivers can tell your on-air experience right away.

that one. True, my 2-meter (VHF-FM) mobile ham radio is great for conversation while traveling, and many amateur repeaters provide touch-tone access to emergency services. But ham radio won't keep me in touch with a whole lot of drivers on the same highway as I'm on—and that's exactly what I use CB for!

What do you think the chances are of getting a southbounder on I-95 on your cellular phone? Cell phones and CBs remind me of the time Colonel Potter received spark plugs when he ordered thermometers. "They're both fine for their intended purpose," he said, "but hardly interchangeable." Touché for the Colonel.

Ham radio and cell phones will never replace mobile CB any more than butter-pecan will replace chocolate. They're two different flavors, and a little bit of each provides a balanced radio diet. The same is true for scanners and shortwave receivers: one's not better than the other, they're just different, and each one has its purpose.

So What's the Secret?

Listen. Yeah—I know—that's too easy. You'd rather have a fancy answer, like "trim your transmission line to 5/16th your age and swing the mic around your head before you transmit." But listening is how professional communicators get all the information they want.

Sometimes I'll just punch up Channel 19 on my mobile shortwave receiver when the CB isn't in the car. True, I don't know what's going on right away, but, after three to five minutes, I have a pretty good idea. And after 10 minutes, I know all I need to about the road behind and in front of me. Y'know what else? You've heard all that interference and useless chatter you sometimes get on your CB? Well, you won't be the cause of any noise when you're listening! Zero. Don't you wish more folks were like that, except, of course, for the person you're listening to? I do. Yes, your radio did come with a microphone, and with good reason. You can give people useful information, you can yell for help when you need it, and when there's room on the channels, you can meet some nice folks and have some fun, too.

But it's professional drivers, as truckers call themselves with tongue just a little in-cheek, that have most of the information most people want. But if you listen, you'll notice that they mainly speak to each other, and, if the truth be known, they'd rather not bother answering us four-wheelers. If a little more truth be known, it's because enough four-wheelers have made themselves pains in the tail to these guys, and the professional drivers have found it easier to ignore them than to answer. So how can you get those truck drivers to talk to you? I thought you'd never ask.

You should ask for a "professional driver." That's not a joke. Professional drivers have chosen that name for themselves. They use it when they're kidding around, but they mean it, too. Everybody likes to be respected for what they do, and professional drivers are no exception. It also shows that you've been around long enough to know the language of mobile CB beyond *Smokey and the Bandit* reruns.

And don't ask those dumb old questions. Really. Just one "howzit lookin' over your shoulder?" and you'll lose your contact—and none of the others who hear you will answer either. If all you want to know is what's up ahead, just listen—you'll find out without ever asking.

You can also try to sound like a beautiful young woman. With all due apologies to the politically correct crowd (and the growing number of female professional drivers), if you sound like a beautiful young woman, or you have someone riding with you who sounds like a beautiful young woman, you'll have more professional drivers calling you than you can shake an antenna at. It's lonely and tiring behind those windshields, and professional drivers are truly the cowboy poets of the road. They'll give you the information you want, and perhaps offer you the moon on a silver platter to boot. This approach is not for the faint-of-heart, though, because ever-so-occasionally, you may hear a response that would make a buzzard blush.

Be the Person Folks Want to Talk to

No, I don't mean you have to take a Dale Carnegie course—just pass along some important information when you can, like a blocked lane, a bad pothole, or sudden icing of the roadway. Pass it along clearly, and plan how you'll say it so it comes out in a way folks can understand. You should include details of the problem, such as lanes that will be affected, the nearest mile marker, or any significant landmark that's near. Now you're the star. You'll get your 15 minutes of fame. Folks will thank you, and those traveling in your direction may sign on as your traveling companions for the duration.

Think about what you're going to say. Imagine you just heard someone else say it. Would you want to hear more from that person, or would you hope he's headed the other way and will be gone in a minute? Bad jokes are the worst, and life's too short for the mean stuff. But good-natured friendly humor can make a long trip short for everyone.

I've had almost 30 years of fun on CB and clowned around with some of the most enjoyable professional drivers you could ever hope to meet. Without them, I'd have to spend all my windshield time tuned to "Easy Listening" FM stations, and I don't think I could ever do that. ■

IT'S A FACT:

Neighborhood Crimewatch programs are proven crime busters. Across America, "citizens on patrol" are keeping a watchful eye on their neighborhoods and reporting suspicious activity to the police. With a CB radio and some help from a few concerned neighbors, *you* can help put felons out of business!

Our affordable, easy-to-install CBs can give your Crimewatch program added safety and success. Because police monitor CB channel 9, help is just a quick call away, and there are no licenses or expensive monthly fees.

So visit your neighborhood Radio Shack today—our friendly staff has the solutions you need to get your Crimewatch program off the ground and on the air!

Radio Shack®

You've got questions. We've got answers.℠

Radio Shack's TRC-493 would be perfect for your patrol. It's the *first* mobile CB with virtually noise-free reception, thanks to Digital Signal Processing that cuts noise, whines and whistles on crowded CB channels.

CRIMEWATCH

Build Your Own Low-Cost 2-Meter Ground Plane

If you're a new ham on a budget and operating on 2-meters, here's an inexpensive, fast way to get your signal out.

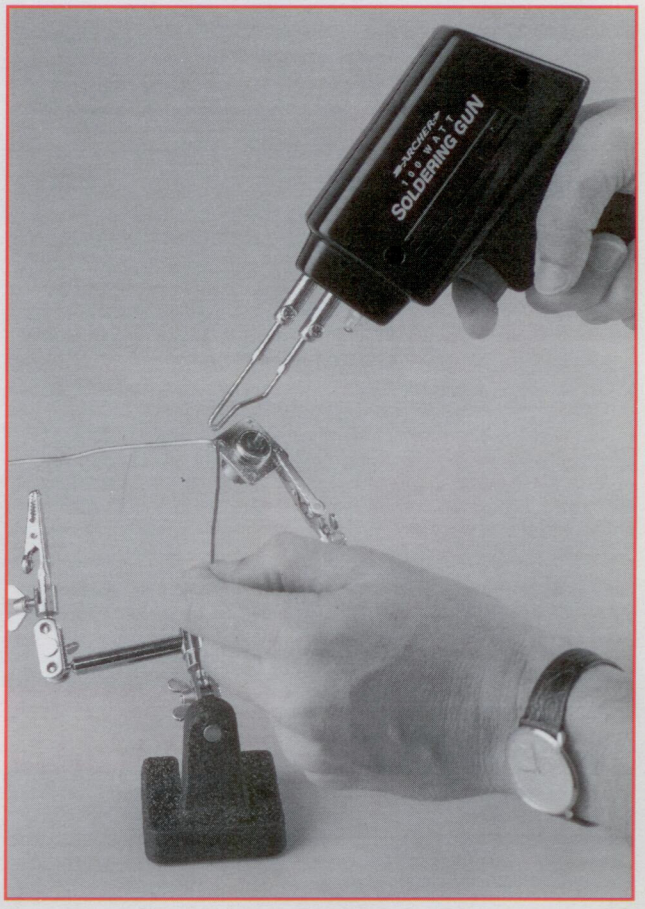
By Harold Ort, N2RLL

In a world where so much of our amateur equipment, from antennas to transceivers, is ready-made, it's always refreshing to be able to build something—anything—from scratch. Here's a super-easy project anyone can build, and it's mighty useful, too.

Some rainy afternoon after you've put in an hour or so studying the Morse code (hint, hint!), go to your spare parts bin and pull out an SO-239 chassis-mount socket. If you don't have a spare, run down to your local Radio Shack store and ask for part #278-201. Right there in your hand you've got part of your new 2-meter ground plane antenna!

Adding the radials is just as easy. The best material for them is stiff coat-hanger wire or, better yet, #12 copper house-wiring (ask your friendly electrician to cut you about 4 1/2 feet of the two-conductor wire). Next, strip the insulation and cut the wire into five 20-inch lengths. If you're using the coat-hanger wire, be sure to scrape away any enamal or other paint coating on the ends so you'll get a good electrical connection.

Using needle-nose pliers, form a small hook in one end of each of the four wires. Insert the hooked end in one of the four holes on the SO-239 mount. Then, using either a small vise or having someone hold the SO-239 mount with needle nose pliers (coax end facing down), carefully solder the wire to the mount. For best results you should use rosin-core solder and a high wattage soldering gun or iron. Don't forget, the correct way to get a good solder joint is to carefully heat the wire and chassis-mount part, allowing the solder to flow freely onto the joint. You might also want to "tin" the wire ends prior to soldering them to the chassis-mount. This is accomplished by carefully applying solder to the wire end PRIOR to inserting it in the chassis-mount hole and final soldering. Repeat these steps for the remaining three wires. Once they're cool, bend the four wires down at about a 45 degree angle. If you're unable to solder these four wires, use Radio Shack machine screws (#64-3011) and hex nuts (#64-3018) to connect the radials to the mount.

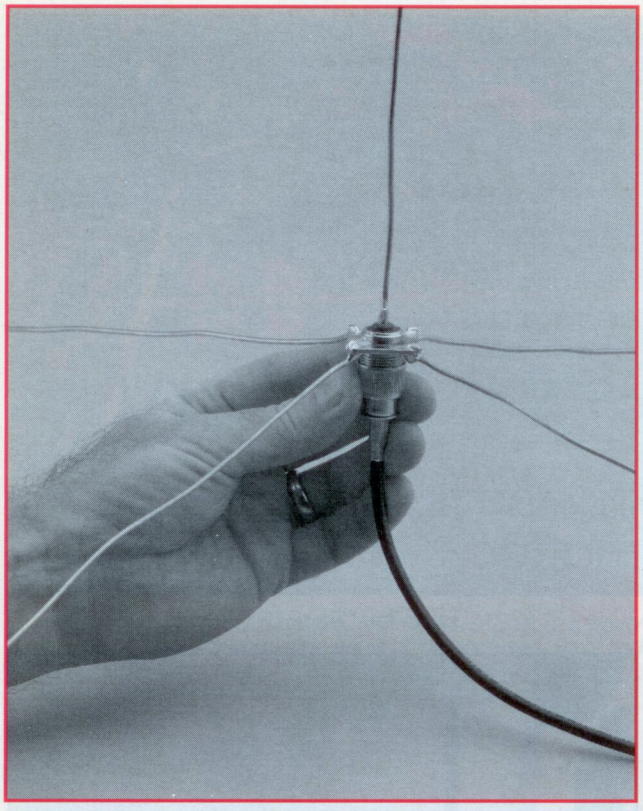


To get a good electrical connection, be sure to heat the socket and wire completely, melting the solder over the joint.

The remaining wire should be soldered to the center connection and kept in a vertical position.

On the Air!

The final length of each assembled radial should be about 19 inches. Connect an appropriate length of RG-58U coax to the SO-239 connector. Be sure to use electrical tape and outdoor RF connector sealant (#278-1645) to weatherproof the coax connection if you'll be mounting the antenna out-



Connect one end of your RG-58U coax to the SO-239 and completely weatherproof the connection if you plan on mounting your antenna outdoors. The length of RG-58U coax should be kept as short as possible—long runs of coax can create signal loss.

doors. Remember to use the sealant where you've soldered the top vertical radial to the SO-239. This will also prevent moisture from entering the completed assembly.

Use your ingenuity to fasten the completed antenna to a short pole, either wood, metal, or PVC. I've fastened my homemade ground plane antenna to a short PVC pipe mounted in the attic. Your local hardware store can help you find a piece of plastic or rubber material to slide over the PL-259 coax connector to allow easier mounting to a pole.

Fire up your HTX-202 and make a call on a repeater you weren't able to hit with your rubber duck. Your ham friends will definitely be impressed by your new creation.

Besides using this home brew antenna on 2-meters, you can put it to equally good use as a basic scanner antenna from 108 to nearly 512 MHz. It isn't a whiz-bang discone scanner antenna, and certainly isn't a state-of-the-art 2-meter ham antenna, but it is an antenna that you *built*! ■

Parts At-A-Glance

SO-239 chassis-mount socket (#278-201)
#12 copper house wiring (or coat hanger)
Needle-nose pliers
Rosin-core solder
High wattage soldering gun or iron
Electrical tape
Outdoor RF connector sealant (#278-1645)
Antenna pole (wood, metal, or PVC)
PL-259 connector on appropriate length of RG-58U coax

NEW! The home/mobile scanner preprogrammed with

2,193 frequencies to go!

This may be the most convenient scanner you'll ever use! Radio Shack's new PRO-2038 zeroes in on local action right out of the box thanks to 2,193 preprogrammed radio frequencies for police, fire, emergency, aircraft, marine and weather services. And because you can power it from home AC plus vehicle 12VDC with an optional power cord, you can scan for active frequencies wherever you are. Great for travel!

PRO-2038 features HyperScan high-speed search and scan, 800-MHz and VHF air bands, 50-channel memory and lockout. You get a built-in speaker and detachable indoor antenna, plus jacks for an external speaker and antenna.

New PRO-2038 is easy to use and packed with features—made to order for novice and experienced scanner buffs alike. Get yours to go today! Only $199.99, only at Radio Shack.

Frequency coverage: 29-54, 108-136.975, 137-174, 406-512, 806-823.9375, 851-868.9375 and 896.1125-956 MHz.

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You've got questions. We've got answers.℠

Choosing The Right Battery

So you need a battery? Finding the right size is easy, but the right type is another matter.

By Bill Price, N3AVY

The Radio Shack HTX-404 works exceptionally well with NiCd batteries. An adapter charges the batteries inside the unit.

Back when I was a kid, picking the right battery meant choosing between the gray one or the blue and yellow one. Ah, those were the good old days—right! I may miss the old DeSoto, but when it comes to batteries, those were *not* the days.

Today, my local store carries more types of watch batteries alone than all the batteries a radio store stocked back then—and they're a bargain, too. But how do you get the right size? What's the right type for your needs, and how can you get the most battery for your buck?

Finding the Right Size

That's the easiest part of all. Almost every piece of equipment that requires a battery tells you right on the battery compartment or cover just what size you need. If you don't recognize what's written there, or if the information is missing, just take your flashlight, CD player, scanner, or gadget to the store with you—someone can help you.

Before I wrote this, I thought I'd try out a couple of stores to see how sharp the help was. While it may no longer be possible to get someone to check your oil, I found that folks in the high-tech stores are eager to show you what they know—and that works to your advantage.

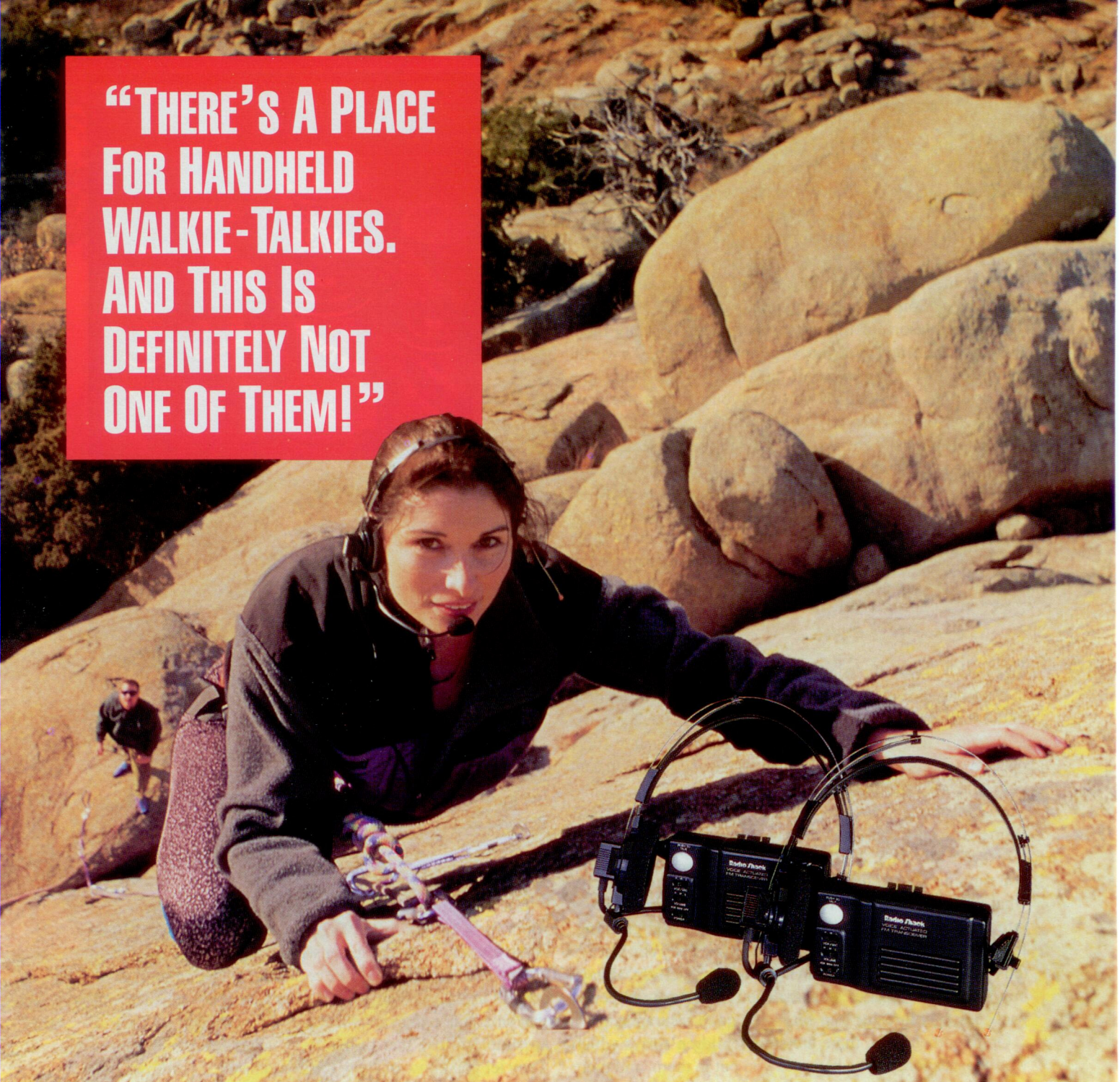
Decisions, Decisions, Decisions

That's what you're faced with when you choose from standard, heavy-duty, long-life, quick-charge, high-capacity, and special-purpose batteries and cells. You'd think someone would write a book—and someone has. Ask your local Radio Shack store folks for the *Enercell Battery Guidebook*, along with a store catalog. If you really want a battery education, that's the way to get it! But, for now, let's look at the basic types, their differences, and what they mean to you.

Throwaway or Rechargeable?

The answer is a question—will you use the device often? And over and over? If so, then RECHARGEABLE batteries or cells are for you. They cost more to buy, and you will need

"THERE'S A PLACE FOR HANDHELD WALKIE-TALKIES. AND THIS IS DEFINITELY NOT ONE OF THEM!"



"Up here, having clear communication with my partner is a must. We rely on our TRC-506 hands-free walkie-talkies to keep in touch, and they've never let us down."

Radio Shack's rugged, dependable 2-way headset radios are lightweight and feature-packed! Look what's built into them:

Dual-conversion superhet receivers drastically reduce interference so speech is clear and intelligible.

49MHz FM operation is ideal for short-range (up to ¼ mile) applications. Provides clear transmission with less noise and interference than Citizens Band.

Voice-activation, with selectable sensitivity control, helps you keep your hands on what's really important.

"We're serious about our fun. No way we'll settle for gear that will leave us hanging. That's why we chose Radio Shack."

The Fun Starts Here!

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to buy a recharger that's made for the batteries you choose. But you can save about $200 a year using rechargeable NiCd batteries in your tape player instead of alkalines. And, what's more, after about a thousand recharges, you'll only have one pair of NiCds to dispose of instead of hundreds of alkalines, making NiCds the environmental choice as well. If you don't have time to recharge between uses, consider two sets of NiCds so you can use one while the other is being charged. That way you'll always have a fresh set ready.

If I seem to be 100 percent in favor of NiCds, that's right—well almost. Some items, though, only get used once a year. That's the reason for throwaway batteries. You buy them fresh, use them, and after you've gotten your money's worth, they're history. Then again, if they happen to be the same size as some of the NiCds you use, you can just use your NiCds for that application, too. You always win with this choice. Your local store has standard NiCds and special high-capacity ones for your particular application. High-capacity NiCds are heavier and cost more, but the money spent on them comes back to you in savings and convenience over and over again. Using NiCds is like priming a pump in the desert—you'd rather drink that water than use it to prime the pump, but once you prime the pump, you'll have more water than you'll know what to do with.

What about Alkalines?

If you use throwaways, should you buy low-end, middle of the road, or top of the line alkalines? Again, the answer is a question—maybe a couple of questions. Are they for a once-in-a-lifetime wedding, inauguration, or coronation, and have you dusted off your electronic flash for the occasion? Then alkaline is your only choice—and buy TWO SETS! Who hasn't used up a set of batteries before the wedding pictures were all taken. And when people in the drug store see you running toward them wearing a tux, they know exactly what you need and they're laughing at you before you get into the door. "Film, flash or batteries?" they ask, grinning. It happens every Saturday, they'll tell you. They can always tell by the mixture of panic and hope on your face. So, always buy TWO sets. If your store will let you return unopened packages, buy three or four sets—it's good insurance.

On the other hand, there are some children's toys which won't last as long as the batteries you put in them, and there are flashlights which will only be needed for about a half-hour, and there are probably a hundred other uses where standard carbon-zinc (low-end) batteries are just the ticket. There's nothing wrong with carbon-zinc batteries in many applications. In fact, there's an illuminated compass for your car that can only use a carbon-zinc battery because it can't use any batteries which contain steel (you can't put steel near a compass, can you?). So don't belittle the old carbon-zinc standby. It has its place.

I once knew a fellow who scrimped on batteries for his smoke detectors, but he's not around anymore. Test them often! Change them once a year, even if they don't seem to need changing. Keep good fresh batteries in the flashlight in your car, even if you never use it—test and change them often. Dead flashlight batteries are an inconvenience at home, but they're a real pain—or worse—on the road. But how do you test them?

Take your pick from a multitude of available types of batteries, but be sure you've picked the one that's right for you.

Get a Battery Tester

It's true, your house is already cluttered and there's no room for a battery tester. Well, let this old packrat tell you about clutter. A battery tester will take up far less room than all those batteries that you've collected, not being sure which are still usable. I got my first battery tester back when no one was smart enough to sell them to the general public. They're so simple to use that they almost never need instructions. They let you know if a battery should be used or thrown out. There are some batteries that come with a sort-of tester built into the package, but frankly, I haven't found them to be very good. Spend a few bucks on a tester for peace of mind. Radio Shack sells three battery testers: 22-095 at $4.99, 22-096 at $6.99 and the 22-032 for $12.99.

So your son's radio control racing car is faster than your station wagon, but it needs a new set of NiCds. Your cordless phone won't take a charge, your battery pack on your camcorder died while the sun set over the Grand Canyon. Just make sure you buy the right battery, and don't forget something else important: ALWAYS CHECK AND FOLLOW ALL LOCAL LAWS WHEN DISPOSING OF ANY BATTERY! ■

Checking the SWR using a Radio Shack SWR/Power Meter and CB.

Standing Wave Ratio—Keeping It Low!

A simple measurement can give you a good picture of how well your antenna system is working.

By Bill Price, N3AVY

Mention amateur or CB antennas and, within minutes, the topic will turn to Standing Wave Ratio (SWR), a meter-measurement of your antenna's performance. Learn how to get it low, keep it low, and how to hold your own in the never-ending quest for perfect resonance—1:1 SWR!

SWR is easy to measure, and it's an accurate indication of your antenna's resonance. It's also a pretty reliable indicator of whether your pattern is distorted, or if your antenna is in the best position—either on your car or on your roof.

Take Five

Before we go on, though, let's spend a moment or two on the subject of *resonance*.

Next time you're near an open piano, have a friend press the right pedal while you stick your face in near the strings and say "Aaaaah," like you would for your doctor. Now listen to the strings echoing the sound you made. The ones that vibrate are doing so because they are *resonant* with the note you spoke into the piano. For our discussion, "resonant" will mean *tuned to the same frequency as the one you're using.*

For your antenna to perform as efficiently as possible, it must be resonant *at or near your desired operating frequency.* If you only transmit or receive on one frequency, you'll be able to tweak and prune your antenna until the SWR meter doesn't even move—ah, Heaven. But, if you're like most folks and operate on a wide range of frequencies, the operative word in antenna resonance becomes *compromise*.

You'll need an antenna (sometimes several individual antennas or a multiband antenna for the ham bands) which will be resonant at or near all the frequencies you plan to use.

For CB, a single antenna can be tuned to resonance at the center of the band (Channel 20 for a 40-channel transceiver). While the antenna won't be as resonant at Channel 1 or Channel 40 as it will be in the middle, it will have an acceptably low SWR (something less than 1.5:1 or so) at those channels and will provide good performance across the entire band.

Why Try for Perfection?

Why indeed. An antenna with an SWR of 1.5:1 (one-and-a-half to one) is 96% efficient—it reflects only 4% of the power fed into it and transmits 96% of the power you give it. There is not a person alive, or for that matter very few pieces of test equipment, that could tell from two blocks away whether you used an antenna with an SWR of 1.5:1 or one with perfect resonance (1:1). Unless you're transmitting fast-scan TV (or a few other uncommon modes), tuning for SWR below 1.2:1 is merely a quest for the grail, but don't take my word for it—see for yourself. Once you start tuning and tweaking, I'll bet you can't stop at 1.25:1.

What You'll Need to Measure SWR

You're gonna love this...an SWR meter. Honest—I'm not being a wise guy—that's what they're called. There are two kinds for CB and amateur radio use: one that measures up to about 30 MHz and one that measures up to about 150 MHz and beyond. The one that measures the higher frequencies costs more, but it won't do anything extra for you at CB frequencies. Some amateur and CB radios have SWR meters built in, and some even have "high SWR warning indicators," but these devices are so useful I can't imagine not owning a separate SWR meter.

Finding Invisible Fields

Of all the things related to radios that "Joe and Josephine Average" can experiment with, antennas are one area where trial and error can be fun, educational, and productive. While you could use sophisticated computer software to model your antenna, or a whole shelf-full of test equipment to design and analyze it, you can also enjoy hours of rewarding experimentation with just a couple of introductory books—and, of course, an SWR meter.

The meter I use also doubles as a field strength meter, which means that someone can transmit in my house or car, and I can walk around outside and see in which direction my signal is strongest. We're not talking about a bazillion-dollar meter here either; mine was about $29—the price of a couple of pizzas.

If for any reason you don't have a CB radio, run out and get one (I'll wait till you get back). If the stores are closed, call a friend who has one and tell him you'd like to come over and learn how to adjust SWR. Take along your SWR meter and a jumper cable (three to six feet of RG-8 or RG-58, with PL-259 [UHF-male] connectors on each end). Radio Shack stores have these jumpers already made up.

The Effects of Objects Near Your Antenna

You may notice that the presence of your hand, arm, or body near an antenna will have an effect on the SWR. While you can see this effect, you should not stand close to an antenna which is radiating: RF energy at close range can be harmful to you, particularly to your head and face!

To see the effect of nearby objects on a *mobile* antenna's SWR (don't try this on the roof of a building), stand back a few feet and move the metal end of a rake or a snow shovel near the antenna. At the same time, have a partner key the mic and observe the SWR meter. The results will show you why the antenna should be out in the middle of the roof or trunk, and not near any interfering objects. You can also try this with a wet, leafy branch, or any number of other objects. For instance, try putting another antenna near the one you're testing—watch what happens to the SWR. This will let you chuckle when you see folks with all their antennas too close to one another.

Try measuring your magnet mount antenna in the middle of the roof, then move it right to the edge, or to a fender. Now set it down on the ground next to the car and measure it when it has no metal ground plane to work against. Park your car close to a building with metal siding and compare the SWR to that which you measured out in the open driveway.

Not only are all these little antenna experiments very interesting, they'll also help keep you aware of how your surroundings affect your listening.

Regardless of whether your radio is a base or a mobile rig, you'll connect the meter in the same way. It's installed "in-line" (it becomes an electrical part of the transmission line, or coax) between your radio and antenna.

Connect the three to six-foot jumper to the antenna connection on your transceiver. Connect your antenna coax to the appropriate female connector on the meter. (Since you'll always need that jumper when you use your SWR meter, leave it attached to the meter when you put it away.)

Calibrate the Meter

Find the switch on your meter that says FWD/REF, or some similar markings to indicate forward and reflected power. Set the switch to FWD. Just key the transmitter (microphone) on an unused frequency, and, while you're holding the button down, adjust the knob so that the meter points to the reference or calibration mark, which is usually on the right side of the meter. Release the button—you're calibrated!

It may sound silly, but I guarantee that if your antenna's SWR is nice and low and doesn't need adjustment, you'll be disappointed. So even if it's perfect, go ahead and adjust it anyway. It'll give you a good understanding of the process, and you'll enjoy knowing you've done it well.

The Actual Measurement

Move the switch on your SWR meter to REF (for reflected power) and key the transmitter again. Make a mental note of the reading or write it down. You can even use a grease pen-

cil (a china-marking crayon) and mark the plastic face of your meter—it wipes off. The number you read, say 1.3 or 2.2, is the first number in your ratio. The second number is a 1, and there's a colon (:) between them. Your reading might be 1.3:1, (pretty good) or 2.2:1 (pretty high). This measurement (ratio) between the maximum voltage and minimum voltage on the transmission line shows the type of match that exists on your system.

Fiberglass base antennas for rooftop installations sometimes have no SWR adjustment. You can adjust older vertical metal antennas by changing the length of the vertical element of the antenna while someone on the ground tells you to make it longer, shorter, or "go the other way, just a bit," etc. Remember, roofs can be slippery, and you'll often find yourself near power lines. If you, or anything you're working on comes into contact with power lines, *you can be killed!* You are not an exception. I've also noticed that roofs get steeper as I get older. In case you find this happening to you, I hope you have an agile, 19-year-old son like I do.

Safety First!

Please refer to the safety instructions included with your antenna before making any rooftop adjustments. If you lost them, stop by your favorite store to look at the safety instructions for the same or similar model as you're working on. Dr. Safety would like you around for the next issue.

Adjusting Your Mobile CB Antenna

To lengthen or shorten your antenna, find the collar or setscrew that loosens to allow you to move part or all of the whip up and down in its base. It doesn't matter which way you choose to start—lengthening or shortening—just try one direction or the other and see if your SWR gets higher or lower. If it gets lower, you're adjusting it in the right direction. Conversely, if it gets higher, you're adjusting it in the wrong direction.

It only takes a few minutes to get the hang of this adjustment business. You'll soon find yourself tweaking way into the wee hours until you have worn out the set screw and achieved the finest SWR of any antenna in your county. You'll have done it yourself and, at the same time, developed an understanding of antenna theory. If you're not careful, you may even end up becoming a ham.

If you have questions, the folks at your favorite Radio Shack are always your first line of defense. Or, if you feel like writing to me, I'll be happy to give your questions my best shot. Drop me a line in care of the magazine. If we get an avalanche, we'll have to think about a Q&A column. Stay safe! ■

Equipment for Checking SWR

Field Strength/SWR Tester 21-523
SWR/Power Meter 21-524
Two-foot coax assembly with connectors 278-968

SCANNER LISTENERS

You may be missing 90% of the action!

Why? Because **public safety frequencies account for only 10% of the action accessible by scanners.** But now you can listen in on the *other* 90% of communications . . . by going **BEYOND POLICE CALL.**

All-new **BEYOND POLICE CALL** is your guide to a world of intriguing, exciting communications. Its 432 pages include local and nationwide frequency listings for security guards and alarm companies . . . theme parks and stadiums . . . movie-production and racing crews . . . hotels, resorts and casinos . . . newspapers, broadcast crews and more.

Available now for just $9.99, **BEYOND POLICE CALL** is the perfect complement to **POLICE CALL**, the "bible" of scanner hobbyists. You'll find both at your nearby Radio Shack, along with over a dozen different scanners and a complete line of accessories.

POLICE CALL and BEYOND POLICE CALL . . . they go together!

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You've got questions. We've got answers.℠

Radio Shack Highlights

News

The Radio Shack Gift Express

As part of its new marketing mission to provide simple answers and innovative services, Radio Shack launched in June its *Radio Shack Gift Express* service—the first nationwide electronics gift distribution program. Now it's as easy to send an electronics gift as it is to send flowers or fruit baskets.

Radio Shack Gift Express is a one-stop convenience for shoppers. Radio Shack will wrap each gift in an attractive box, enclose a personalized card and ship it anywhere in the U.S. (including Alaska and Hawaii) through the FedEx network.

While others offer shipping, Radio Shack's nationwide presence gives it an unmatched ability to provide after-the-sale service and support. Inside the package, gift recipients will receive the addresses of three nearby Radio Shack stores for information, service, repairs or exchanges.

The first phase of the *Gift Express* program was timed to coincide with Father's Day, Radio Shack's second largest gift occasion of the year. Customers could choose from the "Ten Most Wanted Father's Day Gifts." The program has now been expanded to include more than 3,000 items.

Gifts can be ordered at any participating Radio Shack store. The order is electronically confirmed to be in inventory and reserved. It is then gift wrapped, with the personalized card enclosed, and shipped from a national fulfillment center in Forth Worth, Texas.

Radio Shack Gift Express is an exciting new program that will simplify gift shopping for all Radio Shack customers.

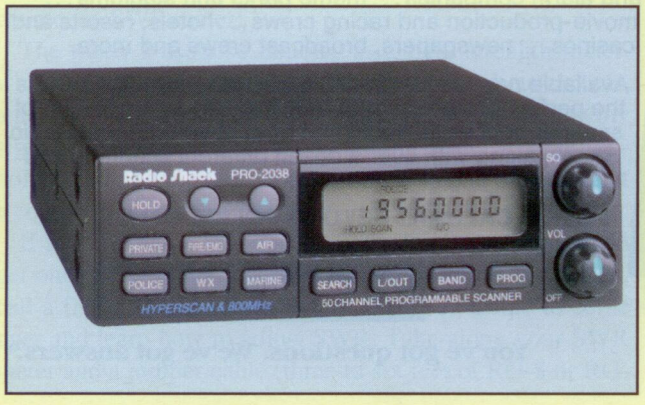
Products

The PRO-2038 Preprogrammed Home/Mobile Scanner (Catalog #20-413)

The new PRO-2038, 50-channel Home/Mobile scanner with 800 MHz coverage operates right out of the box with 2193 preprogrammed frequencies, including those used by police and fire departments, aircraft, marine, and weather communication operations.

A touch of a button rapidly explores those frequencies used by most public service agencies, eliminating the need for tedious and complicated programming. Special or interesting frequencies can be easily grouped and stored in a 50-channel memory.

Other features include Radio Shack's exclusive Hyperscan high-speed scanning search capability, a two-second delay to prevent missed replies, individual lockouts to temporarily bypass channels while scanning others, and a 30-day memory backup.



The PRO-2038 can be mounted in a vehicle with an optional mounting bracket or used as a desktop unit. The enclosure has a flip-down foot for desk use.

Suggested retail price: $199.99.

The PRO-2035 1000-Channel Programmable Home Scanner (Catalog #20-460)

The PRO-2035, Radio Shack's newest and best scanner, provides expanded coverage to 1300 MHz with selectable narrow or wide FM and AM modes for tuning into CB, FM, television sound, and military aircraft bands. Up to 1,000 channels can be selected for scanning.

Using the convenient rotary tuner or keypad, the user can quickly tune to more than 195,000 frequencies. The Hyperscan high-speed scanning feature can scan and search up to 50 channels per second. A Weather Band key scans seven U.S. and three international preprogrammed weather

frequencies for immediate access to the most up-to-date weather information.

The PRO-2035's triple conversion circuit virtually eliminates unwanted "image" signals, even in dense urban areas.

The unit has an auto-programming function that quickly finds and stores active frequencies into specified banks, and searches for additional active frequencies while skipping those previously stored.

Other features on the PRO-2035 include a tape out jack for connecting an optional tape recorder for recording transmissions, a monitor memory for temporarily storing up to 100 frequencies, a two-second scan delay and three-month memory backup.

Suggested retail price: $449.99

2-Meter Mobile Power Amplifier (Catalog #19-1122)

The Radio Shack mobile power amplifier will boost the signal of a 2-meter handheld amateur radio from 2–5 watts input to 30 watts output. This provides reliable communication when operating a handheld radio in a vehicle.

The power amplifier features a helical receive filter and compensating-receive preamplifier, dramatically cutting intermodulation distortion, especially in RF-crowded areas.

The amplifier is for use only on 144-148 MHz FM.

Suggested retail price: $119.99.

Products At-A-Glance

The following charts are intended to give you a quick reference source for products you're interested in.

For instance, if you're looking for a handheld scanner, use the handy specification chart below. It offers the basic information you'll want to know, like number of channels offered, frequency coverage, and priority channel. You'll also find similar information in the charts for mobile scanners, home scanners, and shortwave receivers.

Please pay particular attention to the frequency coverage for a scanner you're interested in purchasing. Upon careful examination, you'll notice that all these models are different in one way or another. It's essential that you determine what radio frequencies are used in your area (consult the current *Police Call* and *Beyond Police Call* books that are available at Radio Shack), how many channels you require, how and where you'll be listening—BEFORE you buy your scanner.

Mobile Scanner from Radio Shack

Model Number	PRO-2026
Channels	50
800-MHz Band	✓
200-400 Ham/Gov't	
Aircraft/Air Nav.	✓
Hyperscan	
Search/Scan Rates	16/16
Priority Channel	✓
Instant Weather	
Memory Backup	
Scan-Delay	✓
Frequency Coverage (MHz)	30-50 50-54 137-174 380-470 470-512

Handheld Scanners from Radio Shack

Model Number	PRO-23	PRO-24	PRO-25	PRO-43	PRO-49	PRO-50	PRO-51	PRO-62
Channels	50	16	200	200	10	20	200	200
800-MHz Band	✓	✓	✓	✓			✓	✓
200-400 Ham/Gov't			✓	✓			✓	
Aircraft/Air Nav	✓		✓	✓			✓	✓
Hyperscan			✓	✓			✓	✓
Search/Scan Rates	16/12	/10	50/25	50/25	/10	16/16	100/50	50/25
Priority Channel	✓		✓	✓	✓	✓	✓	✓
Instant Weather		✓			✓	✓	✓	
Memory Backup	✓	✓	✓	✓	✓	✓	✓	✓
Scan-Delay	auto	auto	✓	✓	auto	✓	✓	✓
Frequency Coverage (MHz)	108-137 137-174 406-512 806-824 806-896	29-54 137-174 406-512 806-823 851-868 896-1125	30-54 108-136 137-174 380-512 806-960	30-54 118-174 220-512 806-823 851-868 896-999	29-50 50-54 137-144 144-148 148-174 406-512	30-54 137-174 380-450 450-470 470-512	29-54 108-137 137-174 406-512 806-956	30-54 118-136 137-174 380-512 806-823 849-960

Home Scanners from Radio Shack

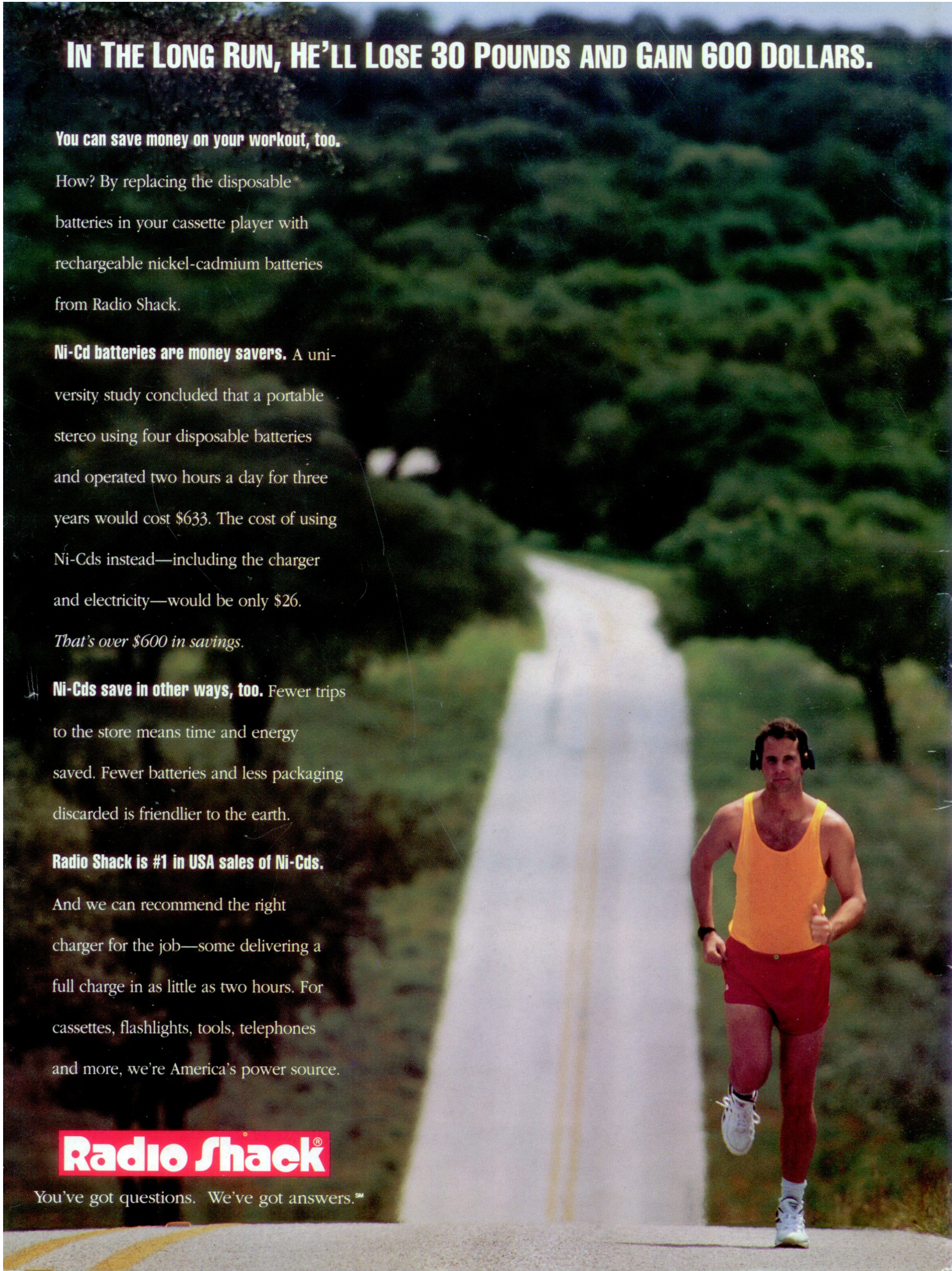
Model Number	PRO-508	PRO-2030	PRO-2033	PRO-2034	PRO-2035	PRO-2036	PRO-2037	PRO-2038	PRO-2039
Channels	20	80	10	80	1000	100	100	50	200
800-MHz Band		✓			✓	✓	✓	✓	✓
200-400 Ham/Gov't					✓				
Aircraft/Air Nav.		✓		✓	✓	✓	✓	✓	✓
Hyperscan		✓			✓	✓	✓	✓	✓
Rotary Tuning					✓	✓			
Search/Scan Rates	16/16	50/50	/12	16/12	50/13	200/20	200/8	/30	50/25
Priority Channel		✓		✓	✓	✓	✓		✓
Instant Weather		✓	✓	✓	✓	✓			
Memory Backup	✓	✓	✓	✓	✓	✓	✓	✓	✓
Scan-Delay	✓	auto	✓	✓	✓	✓	✓	auto	✓
Frequency Coverage (MHz)	30-50 50-54 137-174 380-470 470-512	29-54 108-174 380-512 806-823 851-868 896-956	137-144 144-148 148-174 406-512	29-50 50-54 108-137 137-144 144-148 148-174 406-512	29-54 108-137 137-174 406-512 806-824 851-869 896-1125	30-54 108-137 137-174 380-512 806-960	30-54 108-137 137-174 380-512 806-960	30-54 108-137 137-174 380-450 450-512 806-960	30-54 108-137 137-174 380-450 450-512 806-960

Shortwave Receivers from Radio Shack

Model Number	DX-392*	DX-390	DX-375	DX-370	DX-351	DX-350
Digital/Analog	Digital	Digital	Digital	Digital	Analog	Analog
Dual-Time	✓	✓				
AM/FM Stereo**	✓	✓	✓	✓		
Direct Access Tuning	✓	✓	✓	✓		
Manual Tuning	✓	✓	✓		✓	✓
Memory Tuning	✓	✓	✓	✓		
Scan Tuning	✓	✓	✓	✓		
BFO Controls	SSB/CW	✓				
Sleep Timer/Alarm	ST/A	ST/A	ST	ST/A		
Headphone Jack	✓	✓	✓	✓	✓	✓
Memory Backup	✓	✓	✓			
Weight	3.7 lbs.	3.8 lbs.	18 oz.	18.5 oz.	7.56 oz.	14 oz.
Power***	4 "D"	4 "D"	2 "C"	4 "AA"	2 "AA"	4 "AA"
Frequency Coverage	87.5-108 MHz 150-519 kHz 520-1710 kHz 1.711-29.99 MHz	87.5-108.1 MHz 150-519 kHz 520-1710 kHz 1.711-29.9 MHz	87.5-108.1 MHz 530-1710 kHz 2300-6250 kHz 7100-21850 kHz	87.5 108.1 MHz 522-1620 kHz 520-1710 kHz 2.3-7.3 MHz 9.5-26.1 MHz	88-108.1 MHz 150-280 kHz 530-1710 kHz 4.60 -21.95 MHz	88-108.1 MHz 150-280 kHz 530-1710 kHz 4.60-21.95 MHz

*** Includes built-in cassette recorder**
**** Stereo with headphones only**
***** AC/DC Power Adapter Optional**

"I Know This Lake Better Than Anybody.
That's Why I Wouldn't Come Out Here Without A Good Walkie-Talkie."
Radio Shack
40 CHANNEL
CITIZENS BAND TRANSCEIVER TRC-231
TX 4474 CL
"This lake snakes around some wicked wetlands. If I break down or get turned the wrong way in the wrong part of these waters, or if I've hooked a big one, I want to make sure I can get ahold of the guys back at camp. So I always take along my TRC-231."
Radio Shack's best CB walkie-talkie features full legal power output for long range, LCD S/RF, battery meter and battery-save circuit to conserve power during standby. The TRC-231 also has a ceramic filter and ANL for clear sound and two battery packs for use with alkaline or Ni-Cd rechargeables.
Radio Shack®
You've got questions. We've got answers.℠


IN THE LONG RUN, HE'LL LOSE 30 POUNDS AND GAIN 600 DOLLARS.
You can save money on your workout, too.
How? By replacing the disposable batteries in your cassette player with rechargeable nickel-cadmium batteries from Radio Shack.
Ni-Cd batteries are money savers. A university study concluded that a portable stereo using four disposable batteries and operated two hours a day for three years would cost $633. The cost of using Ni-Cds instead—including the charger and electricity—would be only $26. That's over $600 in savings.
Ni-Cds save in other ways, too. Fewer trips to the store means time and energy saved. Fewer batteries and less packaging discarded is friendlier to the earth.
Radio Shack is #1 in USA sales of Ni-Cds.
And we can recommend the right charger for the job—some delivering a full charge in as little as two hours. For cassettes, flashlights, tools, telephones and more, we're America's power source.
Radio Shack®
You've got questions. We've got answers.℠